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AUTHOR Foote, Tom H.
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ABSTRACT

Because of its diversity of land and people, the challenge of constructing an equitable state aid formula is probably greater for the state of Alaska than for any state in the union. Alaska's present state-aid formula is deficient in at least eight distinct areas: (1) The labels of the formula variables are not relevant to the quantities they attempt to describe. (2) The formula is unnecessarily complicated. (3) The formula provides strong economic incentives for districts to redistribute either average daily membership counts or actual children from one school to another in order to maximize state aid. (4) The portion of the formula devoted to equalization vis-a-vis property wealth is token at best. (5) There are lower tax rates for richer districts. (6) The formula awards districts for failing to control costs that are controllable. (7) The uncontrollable cost differences within groups are ignored. (8) The all-or-nothing character of the isolation factor neglects the wide range of gradations in the actual district-to-district costs. House Bill 212 has aggravated rather than ameliorated the deficiencies. Remedies for these deficiencies include changes in terminology, structural changes in the formula's theoretical undergirdings, and a simpler goal formula. Such remedies need not yield radical shifts in the present levels of state aid and thereby need not meet with overwhelming pro-status-quo political resistance. (Author/JM)

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A DISCUSSION PAPER

# ALASKA'S STATE AID TO PUBLIC SCHOOLS FORMULA: DEFICIENCIES, SUGGESTIONS, AND THE EFFECTS OF HOUSE BILL 212

Tom H. Foote

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May 1978

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*Introductory Comment:*

*This discussion paper was prepared by Tom H. Foote, a doctoral candidate at Stanford University, Palo Alto, California. His participation in the Alaska School Finance Study in 1976-77 was made possible through the cooperation of Dr. Michael Kirst, Professor of Education at Stanford University.*

*The author has done an excellent job in analyzing the strengths and weaknesses of Alaska's Public School Foundation Program. He brought to this task a background in economics, statistical analyses, and a strong sense of objectivity.*

*The changes proposed could improve the foundation program without materially affecting the basic principles upon which it is based. Especially meritorious is the proposed "goal formula."*

*The initial analyses and recommendations were based on the Public School Foundation Program as it was operating in the 1975-76 school year. Subsequently, the effects of House Bill 212, enacted in the spring of 1977, were reviewed and added.*

*We hope this paper serves to stimulate discussion regarding improvements in the Public School Foundation Program. Readers' comments are invited.*

*E. Dean Coon*
*Center for Northern*
*Educational Research*

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## ABSTRACT

Background is given explaining why the challenge of constructing an equitable school finance plan is probably greater for the State of Alaska than for any state in the Union. Deficiencies in the existing state aid entitlement formula are then discussed via a general overview, followed by a piece-by-piece critical analysis of each of the formula's component variables and a numerical example demonstrating how each variable contributes to the final state aid allocation. Within the variable-by-variable critique, suggestions are made for changes in the terminology as well as for structural changes in the formula's theoretical undergirdings. In subsequent chapters, a simpler goal formula is presented which, it is argued, would serve to remedy at least the eight largest problems associated with the present formula. The paper ends with a postscript which describes House Bill 212, especially in relation to its having aggravated rather than ameliorated specific deficiencies mentioned in earlier chapters.



Prepared by Tom H. Foote as a working
paper for the staff of the Alaska
School Finance Study, Center for
Northern Educational Research,
University of Alaska, Fairbanks, Alaska.


Palo Alto, California

## EXECUTIVE SUMMARY

An attempt has been made to present the essence of this paper in the single tableau which follows. Because of the omissions which such a condensation makes inevitable, the reader is urged to use the tableau as merely a summary of--and not a substitute for--the supporting analyses.

| Formula's Deficiency | Goal Formula Solution | Effects of HB 212 Relative to Deficiency |
|---|---|---|
| 1. Labels of formula variables are not relevant to the quantities they attempt to describe (see all variables listed, page 5). Problem is best exemplified with the Basic Need variable described on pages 16 - 17. | Majority of variables purged. Structural content of others modified. New set of labels introduced (compare page 5 with page 23). | Little change. Eliminates Isolation Factor. No effect on all other variable labels (see page 39). |
| 2. Formula is unnecessarily complicated --contains 12 variables (see condensed version of current formula, page 5. See also the numerical example of how the current formula works, Chapter III, page 21). | Two Cost Indices merged into one. Instructional Units Table becomes a simple function. Equalized Percentage operations become a simple function (again, compare page 5 with page 23). | Little change. Basic formula structure unchanged (except for minor modifications in Instructional Units Table, elimination of Isolation Factor, and addition of one regional grouping for Instructional Unit Allotment; see page 37). |
| 3. Formula contains state aid incentives to redistribute ADM counts or actual children. Peaks and troughs in the state aid-per-ADM function are tied to arbitrary ADM levels (see plot, page 9). | Peaks and troughs of Instructional Units Table removed--broken table is replaced by smooth $/ADM function which is closer to realities of fixed and variable costs (compare graphs on page 9 versus page 25). | Problem made worse. Incentives enlarged by accentuated peaks and troughs at much higher cost to taxpayers (see page 38 and plot on page 39). |

| Formula's Deficiency | Goal Formula Solution | Effects of HB 212 Relative to Deficiency |
|---|---|---|
| 4. Portion of formula devoted to equalization vis-a-vis property wealth is token at best (see page 18 ). Range of equalization covers only 5% of total Basic Need. District must have zero wealth to obtain maximum of 5% equalization. | Equalized Percentage is replaced by local option multiplier which severs link between local per ADM property wealth and local per ADM tax receipts (see page 18 versus page 28 ). | Problem made worse. By raising percent of Basic Need guarantee from 95 to 97 percent, margin of equalization is reduced from 5 to 3 percent (see page 37 ). |
| 5. Lower tax rates for richer districts. Scatterplot on page 29 shows that on average, low tax rates are associated with districts possessing high property wealth. | Local Option Multiplier guarantees equal tax revenue for equal tax rates, regardless of wealth (see page 27 ). | No direct change. However, Instructional Unit Allotment increase from 133.75 percent to 155 percent to property-rich North Slope may indirectly exert downward pressure on North Slope property tax rate (see page 38 ). |
| 6. Formula's cost indices embody no effort to compensate districts for uncontrollable costs only (see pages 11 - 16 ). Formula thus awards districts for failing to control costs which are controllable. | Isolation of uncontrollable costs suggested as prerequisite for preparation of education cost index contained in goal formula (see page 27 ). | Problem made worse. Retains practice of grouping districts, and neglecting the isolation of uncontrollable costs while enlarging cost indices. Rewards for failure to control costs which are controllable are thus enlarged at taxpayers' expense (see page 38 ). |
| 7. Fifty-two districts are placed into 8 cost index groups, thus ignoring inter-district cost differences within groups (see pages 11 - 16 ). | Education cost indices will be compiled uniquely for each district according to each district's unique uncontrollable costs. | Little change. Ninth group has been added. Cost indices assigned to groups cover wider range (at higher expense of rewarding failure to control costs which are controllable--see page 37 ). |

| Formula's Deficiency | Goal Formula Solution | Effects of HB 212 Relative to Deficiency |
|---|---|---|
| 8. All-or-nothing character of Isolation Factor neglects range of district-to-district isolation costs (see page 15 ). | Merge isolation factor into education cost index (see page 15 versus page 27 ). | Problem eliminated--though at the cost of increased Instructional Unit Allotments discussed in item 6. above (see page 37 ). |

Enlarging on point 3. above, the fact that the goal formula smooths the now-jagged dollars per ADM function at the peak values rather than at the troughs suggests that redistributional effects will be positive in the cases of all districts not now on a peak value. More precisely, since the goal formula makes it mathematically impossible for any district to fall as much as a penny below such a peak value, most districts will receive higher levels of unadjusted dollars per ADM. This is especially significant when we note, according to multiple-regression analysis of the data for the 1975-76 fiscal year, that unadjusted dollars per ADM exert greater influence on final per ADM state aid (as well as on total overall per ADM expenditures) than all other formula variables combined (see scatterplots on pages 7 and 8 ).

ACKNOWLEDGEMENTS

As a graduate student specializing in school finance, I am grateful to the many who made possible this opportunity to engage in real-world problem analysis concurrently with my coursework. My thanks go first to my advisors, Professors Michael Kirst and Henry Levin, not only for recommending me for the fellowship which continues to support my graduate work, but also for their subsequent advice and support. Equal thanks go to Jim Kelly and the others at The Ford Foundation who made that fellowship possible in the first place.

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Especially helpful with graphics was Katy Lacher. Irma Jean Stichter and Margaret Ecker assisted with the draft. Tim Fullam, of the University of Alaska's Computer Center, deserves thanks not only for helping me perform a host of different "rush" jobs on his computer, but also for helping me to refine a few of my more quantitative analyses. Ron Inouye, Kathryn Hecht, and Jim Orvik brought this disoriented outsider into their homes, and through much rich conversation, took him well beneath the surface of his statistics towards a better understanding of the complexity of feelings and orientations of the Alaskan people.

Last, but not least, my wife, Chula, and our ten-year-old niece, Gail Rigby, not only well tolerated my departures for Alaska, but also made it a pleasure for me to return home. Despite the demands of an outside job, Chula found the time to patiently edit my work, and with Gail's help, to assist me in required computer runs.

Although much of the credit for this final product is due to those acknowledged above, it is I who assume sole responsibility for the soundness of the views and accuracy of the statements which follow.

Tom H. Foote
December 1977
Palo Alto, California

## INTRODUCTION

Public education in Alaska consists of three distinctly different state-wide systems, each financed according to three different sets of rules. Approximately seven percent of what is spent on all three systems goes to the federally administered Bureau of Indian Affairs (BIA) schools and comes entirely from federal sources.[1] Thus, the BIA schools are not affected by the state aid formula about to be discussed. On the other hand, the thirty-one traditionally organized school districts, referred to as "city and borough districts," acquire at least 95 percent of their formula-determined "basic need" from state sources and augment that aid largely with local property tax revenue. Because the twenty-one new Regional Educational Attendance Areas (REAAs) have no property tax, they receive their basic need (and then some) almost entirely from state and federal sources. Putting aside the term "basic need" for later discussion of the formula itself, we need only examine the following table of 1975-76 expense totals to see the magnitude, relative to other revenue sources, of the state's role in financing Alaskan public education:

REVENUE SOURCES FOR CURRENT OPERATING EXPENSES FOR FISCAL YEAR 1975-76

| Revenue Source | ——State Jurisdiction—— City and Borough School Districts | | ——State Jurisdiction—— Alaska Unorganized Borough School District | | ——Federal Jurisdiction—— Bureau of Indian Affairs Schools | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Amount | Percent | Amount | Percent | Amount | Percent | Amount | Percent |
| Local | 38,680,764 | 20% | 212,549 | 1% | -0- | 0% | 38,893,313 | 16% |
| State | 137,735,439 | 72% | 21,484,229 | 55% | -0- | 0% | 159,219,668 | 64% |
| Federal | 14,490,021 | 8% | 17,477,252 | 44% | 17,488,834 | 100% | 49,456,107 | 20% |
| Total | $190,906,224 | 100% | $39,174,030 | 100% | $17,488,834 | 100% | $247,569,088 | 100% |
| Percent of Grand Total | 77% | | 16% | | 7% | | 100% | |
| Average Daily Membership | 79,241 | | 8,885 | | 4,438 | | 92,564 | |
| ADM percent of Total | 85% | | 10% | | 5% | | 100% | |

The circled entries tell us that 64 percent of all public school revenues come from the state in support of 95 percent of the total public average daily membership (ADM). Or, seen in a different light, of the ADM over which the state has jurisdiction (i.e., that 95 percent, excluding the federal BIA schools), the state provides 69 percent of its support.[2] Employed as the central mechanism by which most of this 69 percent is distributed, the formula about to be discussed then clearly plays the major

role among all other distributional variables in determining the levels of resources invested annually in the futures of 95 percent of Alaska's young people. The fact that so far-reaching a formula appeared to exhibit fundamental structural deficiencies was ample motivation to research those deficiencies--not only in the face of growing vigilance by the courts over school finance inequities, but more crucially, in view of the potential long-run, hidden discriminatory effects on Alaska's children and its tax-paying public.

Before detailing the deficiencies, let it be made clear that due to the unique diversity of the land and its people, the challenge of constructing an equitable school finance plan is doubtless greater for the State of Alaska than for any state in the Union. More precisely, in no other state do costs vary as radically from district to district. Many of the state's districts are isolated to the extent that the only means by which they can obtain supplies during certain times of the year is via high-cost, air transport. And to compensate school employees for the additional hardship of having to endure rugged isolation (e.g., minus 60 degree F. arctic temperatures), the more remote districts must pay slightly higher salaries and even provide housing, among other amenities. Furthermore, the isolated "bush" schools are small in terms of numbers of students (hereafter referred to as average daily membership or ADM). The resulting diseconomies of a small scale require some of the highest per ADM expenditures in the nation. Also, the varied Native Eskimo and Indian cultures, and the fact that more than twenty different languages are spoken in Alaska, further compound the problem by creating a vast diversity of educational needs. Finally, the Alaska Department of Education has not yet been able to take advantage of modern data-processing techniques in making state-to-district-aid calculations; most of the many and tedious computations are still performed by human, rather than machine, effort.[3] Indeed, these among other technical problems can be seen to explain much of the present widespread political resistance to substantive school finance reform.

Technical problems aside, it can be argued that the resistance to school finance reform in Alaska also stems from abundance. Alaska's recent spurt of great wealth due to oil revenues has contributed to making that state tops in the nation in terms of state-wide average per pupil expenditures. In short, one could argue that when total Alaskan public school expenditures increase by as much as 48 percent in just two years,[4] contentment over the increases could conceivably keep attention away from seeking basic flaws in the formula by which that money is distributed.

Although the reasons for resisting reform are understandable, the reasons for advocating it are--as this work is intended to clarify--serious enough to warrant attention.

## Chapter I

## OVERVIEW OF THE FORMULA'S DEFICIENCIES

Where is the present Alaska state aid formula deficient? To begin by merely viewing grossly what goes into the formula by way of district characteristics and what comes out as state aid entitlements, we see significant peculiarities in the case of specific districts. For example, despite the fact that in 1975-76 Alaska's richest district, the North Slope Borough district, had $238,474 of taxable property per ADM,[5] making that district 3.18 times richer than Beverly Hills, California (in the same year), that district remains among the top one-third of Alaska's City and Borough districts in terms of state aid received. In fact, the $2,943 per ADM[6] which North Slope received in 1975-76 state aid permitted them to spend $6,368 per ADM[7] in that school year.

Moving from the specific problem of North Slope to the problem of how the formula affects all districts generally, we have dissected the formula, variable by variable, and discussed the problems associated with each. Although many problems surfaced, those which seem to be most critical are:

1. Most of the terms used to describe the component variables of the formula contain little meaning relative to what it is they actually attempt to label. This is especially true of the quantity labeled "Basic Need," described on page 16.

2. The structure of the formula is unnecessarily complicated. Not only can that structure be greatly simplified, it can be made to provide greater equity impact along those dimensions most in need of such impact.

3. The formula provides strong economic incentives to districts either to redistribute school ADM counts, or actually to physically redistribute children from one school to another in order to maximize state aid. The Instructional Units Table upon which the entire formula is based leads to a jagged dollars-per-ADM function which awards substantially more state aid to districts with quantities of students near the peaks of that function than to those districts whose ADM counts are near the troughs (see the leftward-slanted curve segments plotted at the bottom of page 9 ).

4. The portion of the formula devoted to wealth equalization appears to be token at best. That is, regardless of how wealthy a district is, all districts are effectively guaranteed 95 percent[8] of Basic Need. To qualify for 100 percent of Basic Need, districts must have an assessed valuation of zero dollars and not a penny more. And even if the entirety of Basic Need is awarded, the state-wide average of Basic Need falls short of the state-wide averages for those costs which are most basic to keeping the schools open.

5. The actual fiscal year 1975-76 data show that, in general, richer districts in Alaska tax themselves at lower rates and poorer districts tax themselves at higher rates. No attempt is made in the present formula to attack the problem of taxpayer inequity.

6. The formula's cost indices make no effort, implicit or explicit, to isolate and then compensate districts according to uncontrollable supply-side influences on costs. This essentially amounts to a system whereby districts are likely to be rewarded for failure to control costs where in fact those costs can be controlled.

7. By grouping districts and then assigning a simple cost index (Instructional Unit Allotment) to each group, the formula neglects the likelihood that real uncontrollable costs are (1) unique for each district (if not for each school), and (2) widely varied among districts (if not among schools). This leaves open the possibility of within-group inequities. That is, the district whose actual uncontrollable costs are higher than any of those for the other districts within its group is being cheated in a fundamental sense if its compensation (i.e., its Instructional Unit Allotment) is not higher.

8. The five-percent-or-nothing character of the Isolation Factor discussed on page 15 neglects the wide range of gradations in district-to-district actual uncontrollable costs of being isolated from the major population/supply centers of Alaska. That is, even though it is quite unlikely that actual uncontrollable costs due to isolation are anywhere near being equal among isolated districts, the Isolation Factor's compensation is identical for each of those districts.

These eight principal weaknesses, along with other criticisms and suggestions, are perhaps most clearly comprehended in the context of the entirety of the formula from which they come.

## Chapter II

## DISSECTING THE FORMULA

### Introduction

The problems cited in Chapter I are probably best illustrated by taking apart the entire formula piece-by-piece and carefully discussing its component variables. In its simplest form, condensed from over 6,000 words of legal jargon (see Alaska Statutes, Title 14, Chapter 17)[9] the formula appears as follows:

Alaska's Present State Aid Formula

$$SA_i = \overbrace{IU_i \times \overbrace{BIU \times UIA_i \times IF_i}^{IUV_i}}^{BN_i} \times \overbrace{(1 - (1 - ML) \times \frac{PV_i}{PV_s})}^{EP_i}$$

$$RLE_i = BN_i - SA_i = BN_i \times (1 - ML) \times \frac{PV_i}{PV_s}$$

| Where: | | Discussed on Page |
|---|---|---|
| $SA_i$ | = State Aid allocated to district "i" | 6 |
| $IU_i$ | = Quantity of Instructional Units for district "i" | 6 |
| BIU | = Basic Instructional Unit | 11 |
| $IUA_i$ | = Instructional Unit Allotment for district "i" | 12 |
| $IF_i$ | = Isolation Factor for district "i" | 15 |
| $IUV_i$ | = Instructional Unit Value for district "i" | 15 |
| $BN_i$ | = Basic Need for district "i" | 16 |
| ML | = Minimum Level of state support of Basic Need | 17 |
| $PV_i$ | = Property Valuation per ADM for district "i" | 18 |
| $PV_s$ | = Property Valuation per ADM for the state as a whole | 18 |
| $EP_i$ | = Equalized Percentage for district "i" | 18 |
| $RLE_i$ | = Required Local Effort for district "i" | 19 |

Clearly, left with just the above variables and variable labels, the newcomer to Alaska State school finance is likely to encounter some difficulty in deciphering their meaning, to say nothing of the difficulties he or she might experience in deciphering the meaning of the law as it is written.

In this author's opinion, a simple relabeling of certain terms would ease the learning difficulties for the newcomer and, even more beneficially, would reduce the confusion which continues to surface even today among those people who work with these terms on a daily basis.[10]

In an attempt to (1) clarify the meaning behind each term, (2) indicate problems related to each, and in most cases (3) suggest alternative labels, a discussion of each term as it stands alone is presented below. The order of the discussion will follow the left-to-right order in which the terms appear in the formula above:

State Aid Allocated to a Given District "i" ($SA_i$).

The label given to this variable is reasonably self-explanatory. It represents the aid allocated via the entitlement formula by the state to a given district "i", according to how that district "i" rates among all the formula variables on the right-hand side of the equation. Since the term "state aid" probably labels what is going on better than any other term, no alternative label is recommended.

Quantity of Instructional Units for District "i" ($IU_i$)

According to Alaska state law, an instructional unit is "the aggregate of all direct and indirect services necessary to provide a standard level of instruction for a group of pupils."[11] For the given district "i", the quantity of instructional units is read from several "Instructional Units Tables" according to the regular, vocational education, and special education average daily membership possessed by that district. For purposes of illustration, we show below only the table of allowable instructional units for regular education in elementary and secondary schools of districts with ADM less than 1,000 (just as the table appears in the Alaska Statutes).[12]

An Instructional Units Table

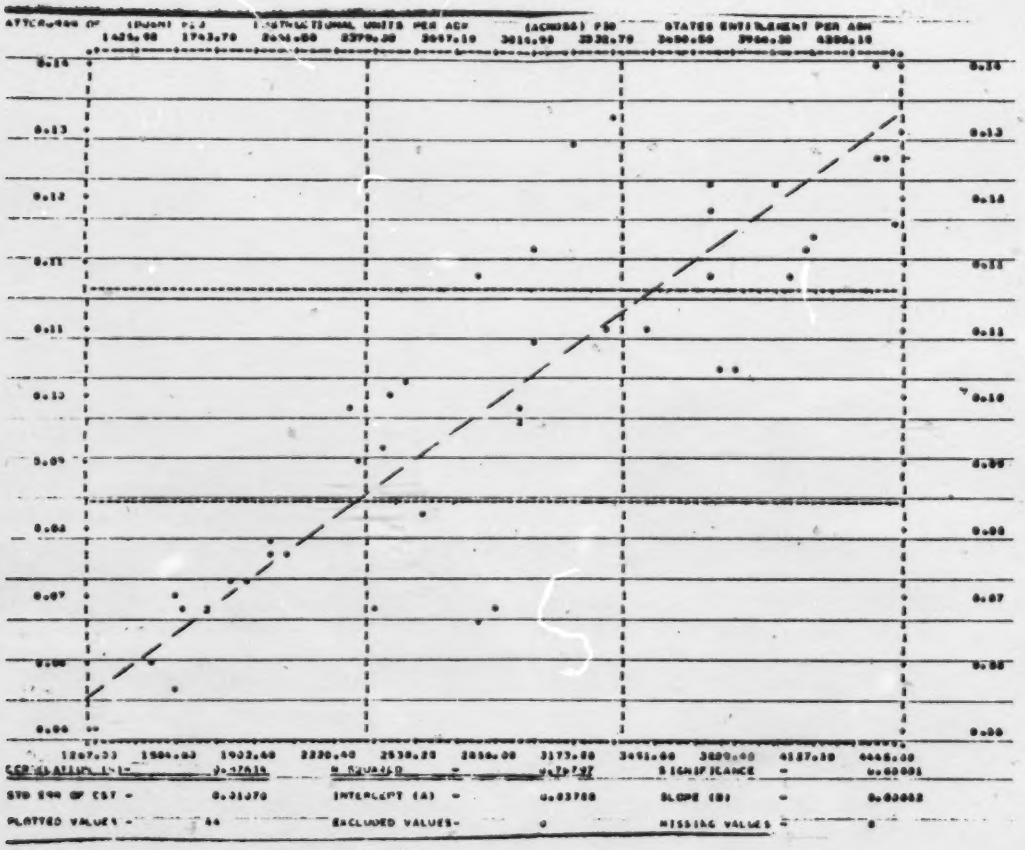
| ADM | No. Instructional Units |
|---|---|
| under 10 | 1 |
| 10-20 | 2 |
| 21-32 | 3 |
| 33-46 | 4 |
| 47-62 | 5 |
| 63-80 | 6 |
| 81-999 | 6 plus 1 for each 18 pupils, or fraction of 18 |

The tables enter into the formula as follows: Each district (1) tallies up its levels of ADM for each of the three different categories (e.g., regular, vocational, and special education), (2) reads off the quantities of instructional units into which each of those ADM levels translate, and (3) sums those instructional unit totals for the three ADM categories to obtain a single grand instructional unit total for the district. That total is then inserted into the formula and serves as that formula's single most influential variable in terms of effects on absolute state aid entitlements.

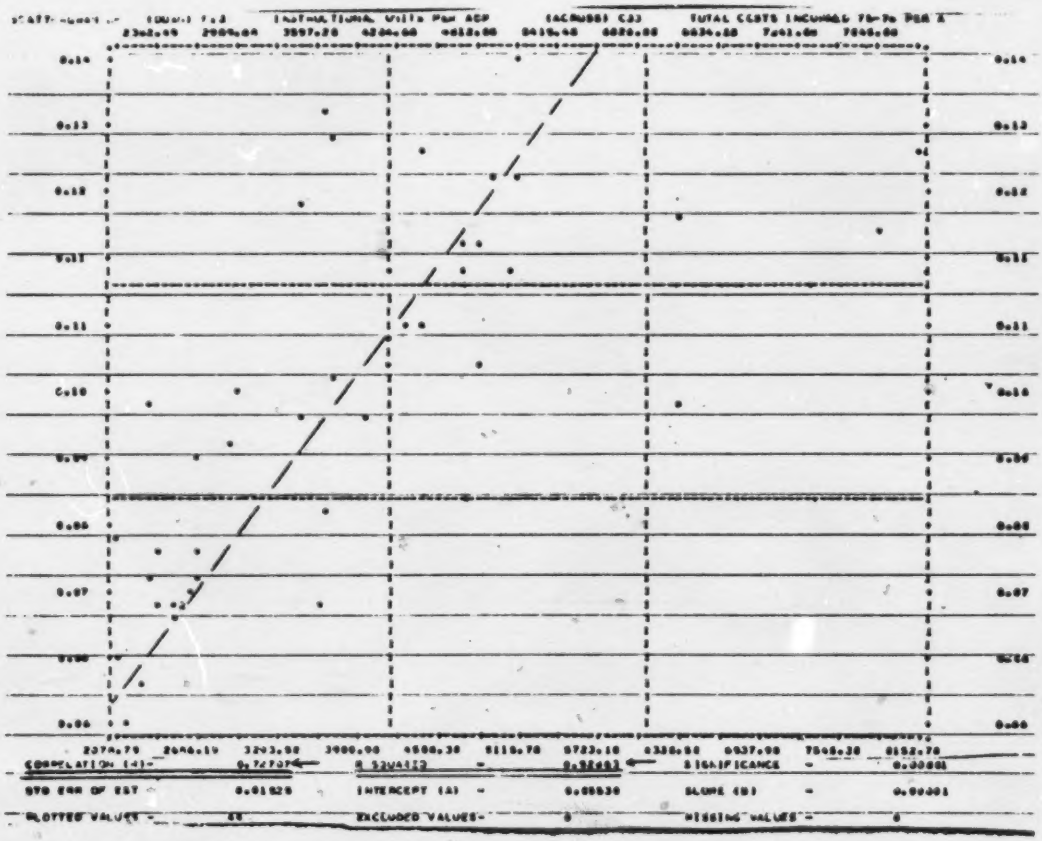
Instructional units also represent the single most important variable

in relative terms. More precisely, if we consider instructional units per ADM, we find this variable to exert tremendous influence not only on foundation entitlements per ADM, but also on total overall district expenditures per ADM. This is best seen graphically. On pages 7 and 8 are scatterplots which plot actual 1975-76 instructional units per ADM on the vertical axis, versus actual 1975-76 foundation entitlement per ADM on the horizontal axis. Quite consistently, districts receiving low values of instructional units per ADM also received low values of state entitlements per ADM. Conversely, districts with higher values of instructional units per ADM received higher per ADM state entitlements. Turning to the second scatterplot, we see an almost as strong relationship between actual 1975-76 overall expenditures per ADM. These plots, in concert with more sophisticated statistical analysis, lead to the conclusion that the single strongest influence on the differences between what is spent per child from district to district in Alaska--stronger even than the Instructional Unit Allotment variable--is the Instructional Units per ADM variable and the tables from whence it comes.[13]

SCATTERPLOT OF INSTRUCTIONAL UNITS PER ADM VERSUS
STATE ENTITLEMENT PER ADM

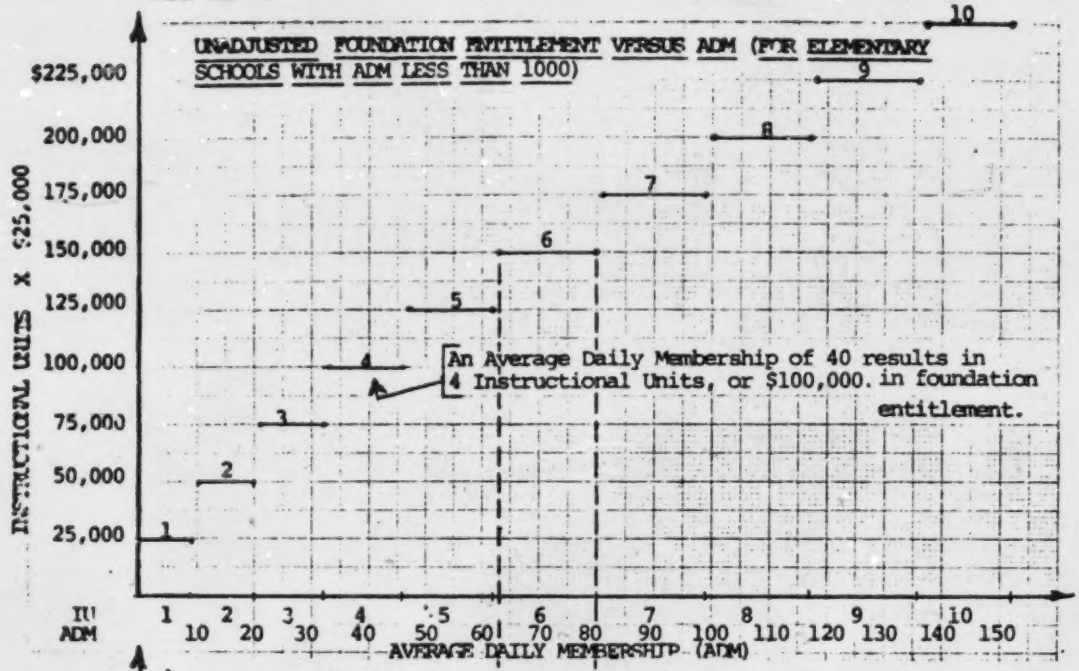


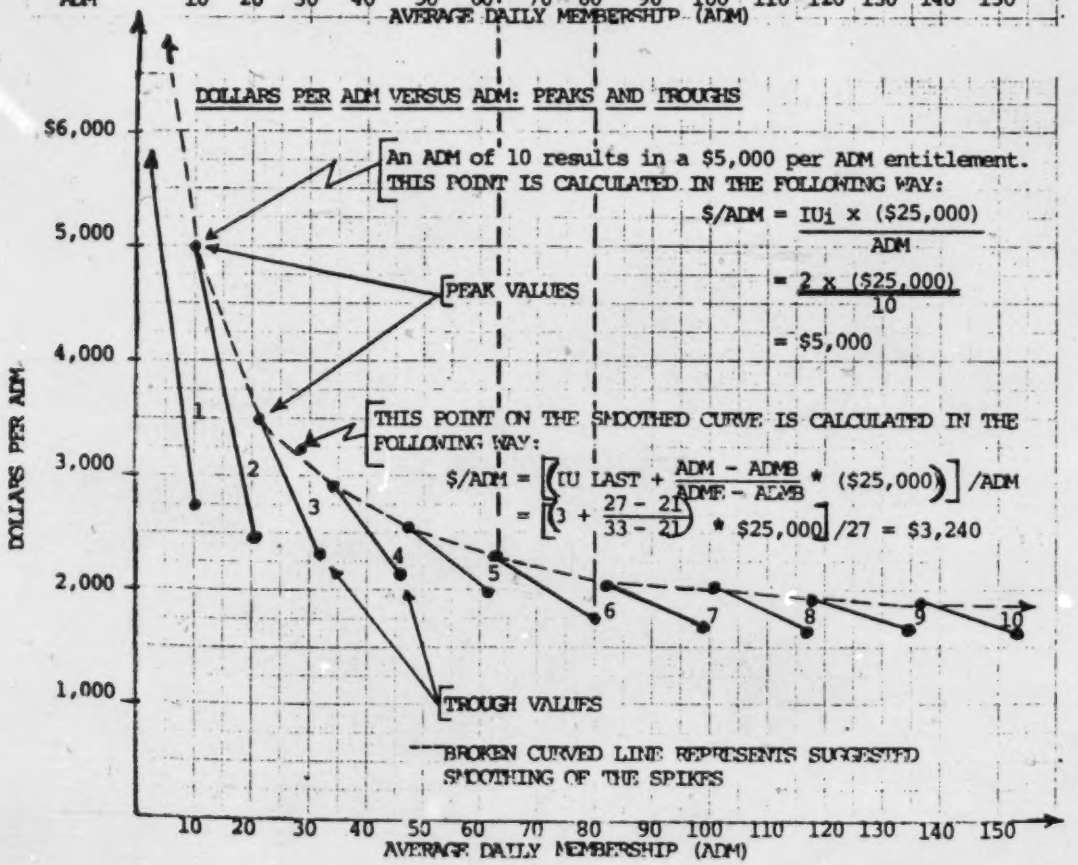
SCATTERPLOT OF INSTRUCTIONAL UNITS PER ADM VERSUS
TOTAL EXPENDITURES PER ADM



Judging from the numbers contained in the instructional units tables and from the above legal definition of an instructional unit, it appears that the designers of the formula were attempting to translate total numbers of students into a quantity of classroom equivalents. The underlying theory behind such a table was probably that overall school costs are more directly a function of classroom equivalents (e.g., one teacher plus one classroom for every "X" amount of students) than they are of ADM, and that economies of scale cause the per ADM costs of the first classroom added to a district to be significantly higher than those per ADM costs of the last.

However strongly one might wish to believe in this quantum approach to school finance, the fact is that its implementation in the form of an instructional units table provides state aid incentives for districts to redistribute either ADM counts or students from one school to another. The graphs on the following page and the discussion following them should clarify this structural flaw.


UNADJUSTED FOUNDATION ENTITLEMENT VERSUS ADM (FOR ELEMENTARY SCHOOLS WITH ADM LESS THAN 1000)
INSTRUCTIONAL UNITS x $25,000
$225,000
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
An Average Daily Membership of 40 results in 4 Instructional Units, or $100,000. in foundation entitlement.
IU
ADM
AVERAGE DAILY MEMBERSHIP (ADM)


DOLLARS PER ADM VERSUS ADM: PEAKS AND TROUGHS
DOLLARS PER ADM
$6,000
5,000
4,000
3,000
2,000
1,000
An ADM of 10 results in a $5,000 per ADM entitlement. THIS POINT IS CALCULATED IN THE FOLLOWING WAY:
$/ADM = IUi x ($25,000) / ADM
= 2 x ($25,000) / 10
= $5,000
PEAK VALUES
THIS POINT ON THE SMOOTHED CURVE IS CALCULATED IN THE FOLLOWING WAY:
$/ADM = [(IU LAST + (ADM - ADMB) / (ADME - ADMB) * ($25,000))] /ADM
= [(3 + (27 - 21) / (33 - 21) * $25,000] /27 = $3,240
TROUGH VALUES
BROKEN CURVED LINE REPRESENTS SUGGESTED SMOOTHING OF THE SPIKES
AVERAGE DAILY MEMBERSHIP (ADM)

The graph on the top of page 9 presents a plot of the quantity of instructional units times the value of each instructional unit versus average daily membership (for elementary schools in districts with ADM less than 1000). Stated more simply, this represents a plot of the base quantity of foundation entitlement a district would receive for a specific level of average daily membership. For example, an average daily membership of 40 would yield 4 instructional units. At $25,000 per instructional unit, this would amount to $ 100,000 in unadjusted entitlement.

The solid leftward sloping curve segments plotted at the bottom of the page show the total base amount allocated, divided by the corresponding ADM, and in turn plotted against that ADM. For example, if the ADM level is 10, that yields 2 instructional units. At $25,000 per instructional unit, this amounts to $50,000. Dividing $50,000 by the ADM of 10 translates into a level of support of $5,000 per ADM (which can be read from the curve where ADM equals 10 on the horizontal axis).

In illustrating the incentives problem, assume the ADM level is 9 rather than 10. With one less ADM, the district above is entitled to only one instructional unit, or $25,000. Dividing this by 9 amounts to only $2,778 per ADM, which can also be read from the curve at ADM equal to 9 (the first "trough" value). This represents only 56 percent of what that district would receive if it had but one more ADM!

Clearly, Alaska's school districts do face incentives to structure their school sizes in order that they land on, or near, the high (i.e., the "peak") rather than the low (i.e., the "trough") ends of the relevant leftward-slanted curve segments.[14]

For purposes of a district-wide example, assume a district consists of 10 schools of nine students each. Regardless of considerations of transportation problems or of hardships to the children, that district faces an irresistable incentive to break up its tenth school and send each one of its students to each of the nine remaining schools. This gives each of those 9 schools 10 students rather than 9, allowing that district $50,000 per school rather than $25,000; the ADM values hit 9 "peaks" rather than 10 "troughs." More specifically, whereas in the "trough" case the district qualifies for ten times one instructional unit (10 x $25,000) or $250,000, in the "peak" case, that same district is entitled to nine times two instructional units (9 x $50,000) or $450,000 with the same number of students. In short, the district in this example could increase its entitlement by as much as 80 percent merely be redistributing students!

To what extent is student redistribution for increased revenues actually taking place? Although a firm answer to this question awaits the results of one of our computer-aided, statistical analyses, certain Alaska school superintendents have stated to this author, openly and unapologetically, that they were in fact engaged in such a practice.[15]

Given the obvious large dollar amounts involved, the formula seems to leave the district superintendents with little choice. In effect, this amounts to unnecessary state encroachment upon local control.

One immediate approach towards solving the problem which, incidentally, is likely to be of high political feasibility, is to construct a curve which connects the peak values, as indicated by the dashed curve in the graph at the bottom of page 9 . (Calculations used to compute the points which make up the dashed curve appear on the graph itself.) Such a curve would remove the incentives for ADM redistribution simply because it would remove all peaks and troughs. At the same time, such a curve would preserve the essential consideration of "decreasing per ADM costs with increasing ADM," i.e., "economies of scale." Moreover, such a smoothing at the high points should be acceptable to the districts because it would mean significantly more money for them. That is, this proposal would make it impossible for anyone to be on less than a peak value at all times: All districts would receive maximum dollars per ADM. Finally, by constructing the curve from the instructional units tables themselves, we minimize the politically undesirable departure from the status quo. Ultimately, this could serve as a stepping stone to a wholly new, empirically derived curve which would make a complete departure from the apparently non-empirical and problematic instructional units framework (such a curve is presented in Chapter IV).

The major drawback of the smoothing suggestion is that it is certain to cost the state substantially more. If, however, the increased costs present an insurmountable political barrier in terms of taxpayer objections, those costs could be reduced by simply smoothing at points below the peaks; e.g., between the points defined by the 80 percent of peak values.[16] The benefits of discarding unnecessary, and potentially harmful, incentives--incentives which amount to state dictates of local policy--may be well worth the additional costs.

Returning to terminology, the words "instructional unit" do not clearly label what in fact this quantity represents. The actual quantity being labeled is a basic cost unit, which, as far as we can tell, is most closely related to the expenses of providing a classroom of students with basic instruction for the period of one school year. Changing the term to "basic classroom equivalent" seems to be more specific to accurately describing the quantity at hand.

Basic Instructional Unit (BIU).

This is not, as the newcomer to Alaska state school finance may be understandably misled to assume, another type of instructional unit distinct from the instructional unit described above. Rather, this is the pre-adjustment value in dollars ($25,000 at the time of this writing) of an instructional unit. Relabeling this quantity to something like "Base Instructional Unit Value" or perhaps better, "Base Classroom Cost" appears to be warranted.

Instructional Unit Allotment for District "i" ($IUA_i$)

Rather than labeling a bona fide absolute allotment, these three words actually label a cost adjustment factor, or cost index. Its role in the formula is to adjust the state aid entitlement in order to account for the significantly different costs of providing educational services from district to district.

As pointed out in Hyman, et. al., [17] and experienced by the State of Alaska, the current state of the art for school district cost indexing suffers from empirical underdevelopment and operational contradiction. Not the least of the sources for operational contradiction is the challenge of separating the influences of "supply-side variables" from those of the "demand side." More clearly, "supply-side influences" are those influences on prices, wages, or salaries over which the demander has little or no control. For example, if instructional materials sell for a particularly high price because their supply is low, e.g., due to the remoteness of the area and difficulties of transport, this then represents a supply-side influence over which the district purchaser has little or no control. Compensating districts for such uncontrollable supply-side influences represents the ideal application of cost-adjustment factors within school finance formulae.

Conversely, "demand-side influences" are those influences on such prices or wages over which the demander has substantial control. For example, if the number of qualified teachers seeking teaching jobs is high, as we know it to be presently nationwide, then, theoretically at least, district demanders of teacher services should be able to exert substantial control over teacher salaries. Failure to exert this control is hardly something for which districts should be compensated. More precisely, the last thing we want to do is write something into law which rewards districts for "being soft" and thereby unnecessarily increasing the costs for the same level of educational services. In short, one of the key prerequisites for constructing a non-contradictory, cost-adjustment scheme is the elimination of as many controllable demand-side influences as possible. Thus far, no systematic attempt has been made in Alaska to approach the problem from this perspective.

A second criticism of the instructional unit allotment is that it neglects the continuum of wide variation in uncontrollable costs (e.g., transportation costs) by placing each of the 52 districts in one of eight groups, and then assigning a flat IUA percentage to each group. As an example that real cost differentials are not likely to fall into any such discrete groupings, the reader is asked to inspect the following table of Alaskan air fares and air freight rates:

## Alaskan Air Fares and Air Freight Rates, July 1976[18]

| Place | Alaska Destination in Region | Round Trip Air Fare to Alaska Destination | Round Trip Air Fare to Seattle | Air Freight Rate for 100 lb. Shipment from Seattle |
|---|---|---|---|---|
| Anchorage | — | $ — | $246.15 | $ 28.05 |
| Bristol Bay (King Salmon) | Anchorage | 99.73 | 345.88 | 37.45 |
| Cordova | Anchorage | 55.00 | 245.39 | 29.20 |
| Craig | Ketchikan | 44.44 | 195.13 | 33.40 |
| Dillingham | Anchorage | 117.72 | 363.87 | 39.40 |
| Fairbanks | — | — | 265.61 | 28.05 |
| Galena | Fairbanks | 89.72 | 355.33 | 39.35 |
| Haines | Juneau | 64.80 | 250.48 | 45.60 |
| Hoonah | Juneau | 46.00 | 231.68 | 43.60 |
| Hydaburg | Ketchikan | 48.00 | 198.69 | 31.45 |
| Juneau | — | — | 185.68 | 23.60 |
| Kake | Ketchikan | 115.86 | 220.74 | 37.85 |
| Kenai | Anchorage | 30.00 | 276.15 | 39.05 |
| Ketchikan | — | — | 150.69 | 19.45 |
| King Cove | Anchorage | 325.73 | 571.88 | 66.05 |
| Klawock | Ketchikan | 48.00 | 198.69 | 31.45 |
| Kodiak | Anchorage | 90.88 | 284.43 | 26.95 (summ |
| Mat-Su (Palmer) | — | — | (Anc) 246.15 | (Anc) 28.05 |
| Nenana | — | — | (Fbk) 265.61 | (Fbk) 28.05 |
| Nome | Fairbanks | 147.72 | 415.97 | 47.95 |
| N. Slope (Barrow) | Fairbanks | 145.74 | 410.50 | 51.55 |
| Pelican | Juneau | 85.44 | 271.12 | 45.60 |
| Petersburg | Ketchikan | 75.86 | 180.74 | 25.85 |
| Selawik | Fairbanks | 201.43 | 467.04 | 54.95 |
| Sitka | Juneau | 57.74 | 174.74 | 25.85 |
| Skagway | Juneau | 69.12 | 254.80 | 45.60 |
| St. Mary's | Anchorage | 145.74 | 391.89 | 42.40 |
| Unalaska | Anchorage | 381.74 | 573.22 | 67.05 |
| Valdez | Anchorage | 45.00 | 291.15 | 48.05 |
| Wrangell | Ketchikan | 67.60 | 218.29 | 44.70 |
| Yakutat | Juneau | 71.74 | 257.42 | 27.50 |

Alaskan Air Fares and Air Freight Rates, July 1976 (continued)

| Place | Alaska Destination in Region | Round Trip Air Fare to Alaska Destination | Round Trip Air Fare to Seattle | Air Freight Rate for 100 lb Shipment from Seattle |
|---|---|---|---|---|
| N.W. Arctic (Kotzebue) | Fairbanks | $147.72 | $415.97 | $ 47.95 |
| Bering Strait (Nome) | Fairbanks | 147.72 | 415.97 | 47.95 |
| Lower Yukon (Mt. Village) | Anchorage | 195.46 | 441.61 | 47.40 |
| Lower Kuskokwim (Bethel) | Anchorage | 133.72 | 379.87 | 42.05 |
| Kuspuk (Aniak) | Anchorage | 131.74 | 377.89 | 39.10 |
| S.W. Region (Dillingham) | Anchorage | 117.72 | 363.87 | 40.10 |
| Lake & Peninsula (King Salmon) | Anchorage | 99.73 | 345.88 | 37.45 |
| Aleutian Chain (Cold Bay) | Anchorage | 295.73 | 541.88 | 66.05 |
| Pribilof Islands (St. Paul) | Anchorage | 409.73 | 655.88 | 71.05 |
| Adak (Adak) | Anchorage | 437.72 | 626.12 | 73.05 |
| Iditarod (McGrath) | Fairbanks | 75.73 | 317.73 | 35.60 |
| Yukon-Koyukuk (Nenana-Tanana) | — | — | (Fbk) 265.61 | (Fbk) 28.05 |
| Yukon Flats (Fort Yukon) | Fairbanks | 60.00 | 325.61 | 42.05 |
| Upper Railbelt (Clear) | — | — | (Fbk) 265.61 | (Fbk) 28.05 |
| Delta/Greely (Big Delta) | Fairbanks | 78.00 | 343.61 | 48.05 |
| Alaska Gateway (Tok) | Fairbanks | 78.00 | 343.61 | 48.05 |
| Copper River (Glennallen) | Anchorage | 45.00 | 291.15 | 48.05 |
| Chatham (Angoon) | Juneau | 58.00 | 243.68 | 45.60 |
| S.E. Islands (Ketchikan) | — | — | 150.69 | 19.45 |
| Annette Island (Metlakatla) | Ketchikan | 28.00 | 178.69 | 27.50 |
| Chugach (Whittier) | — | — | (Anc) 246.15 | (Anc) 28.05 |

Although such rates make up only a component of actual uncontrollable cost differentials, they are likely to comprise a significant component since transportation costs in general are likely to be more tightly correlated with those differentials than any other cost variable. Correlations aside, the point to be obtained from the foregoing table is that because actual uncontrollable cost differentials are a function of individual district characteristics, and hence probably are unique for each district (if not for each school), then so too should be the state's compensation for those uncontrollable differentials. Otherwise, the district whose actual uncontrollable cost differential is higher than any of those for the other districts in its group is being cheated in a fundamental sense if its compensation is not higher. A reasonable alternative would be to scrap the groupings altogether and compute an individual cost of education index for each district on the basis of each district's unique uncontrollable costs.

Isolation Factor ($IF_i$)

What is referred to as "the Isolation Factor" in discussions of Alaska school finance is actually, according to Alaska Statutes (Sec. 14.17.051, part c), a component of the Instructional Unit Allotment. Essentially, "any school district which does not have access to Anchorage, Ketchikan, or Fairbanks by road, railroad, or Alaska State Ferry" shall have its Instructional Unit Allotment increased by five percent of that allotment (e.g., 1.3375 x 1.05). In our formula, the variable $IF_i$ is either set to 1.05 for those districts isolated according to the above criterion or left at 1.00 for those districts which are not. In other words, isolated districts receive five percent more state aid than unisolated districts--all other things being equal.

A dichotomous five-percent-or-nothing compensation clearly suffers from the same methodological flaw as does grouping districts and assigning a cost index to each group. Just as actual uncontrollable costs due to non-isolation variables are likely to (1) be unique for each district (if not for each school), and (2) vary widely among districts (if not among schools), so too are the uncontrollable costs due to isolation. More simply, it is not likely that actual uncontrollable costs due to isolation are identical for all isolated districts. We are thus hard-pressed to defend the identical isolation premiums now awarded by the Isolation Factor.

Instructional Unit Value ($IUV_i$)

This composite is an intermediate value for a given district which, as indicated by the bracket under the formula, is calculated by multiplying the Basic Instructional Unit times the Instructional Unit Allotment. The resulting product represents the basic classroom cost adjusted presumably according to differences in costs (not exclusively uncontrollable costs!) as defined by the eight Instructional Unit Allotment groupings discussed above.

In the author's opinion, this term does not accurately label the quantity under consideration. Since we are actually dealing with a quantity which reflects the estimated cost of a basic classroom equivalent of educational services, once adjusted for the most relevant cost differences between districts, the term "adjusted classroom-equivalent cost" or even "adjusted cost" is suggested.

Basic Need for District "i" ($BN_i$)

"Basic Need" is another intermediate value which, as indicated by the first bracket above the formula, is calculated by multiplying the adjusted Instructional Unit Value times the quantity of Instructional Units.

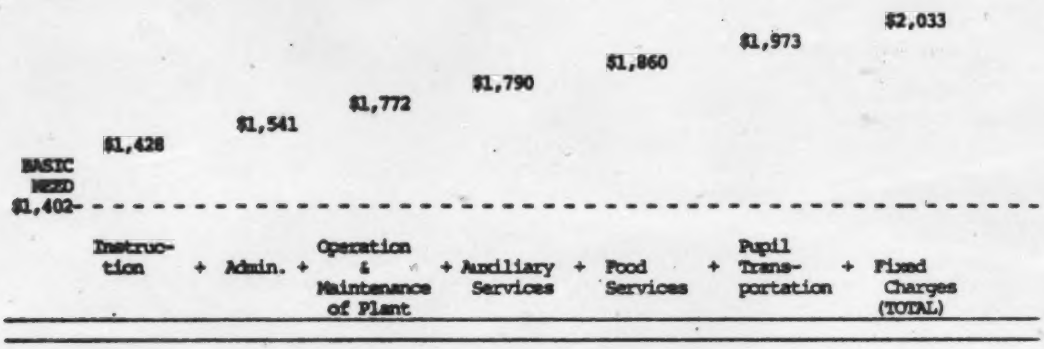
Basic Need is one of the more important and yet the most ambiguous of all the components of the formula. It represents the foundation upon which the entire state-wide system in Alaska rests. Its ambiguity is most aptly described by the following passages taken from a paper entitled "A Strategy for Defining Basic Need" prepared by the Center for Northern Educational Research.

> Basic need might more properly be referred to as basic financial need, but even adding the word financial does not remedy what many consider the central problem of definition. That larger problem comes from the word 'need.' If 'need' is defined as 'lack of something,' or a 'state of circumstances requiring something,' then it follows that a sum of dollars is not the need, but rather a resource to alleviate a need either partially or fully. Thus, the dollars would fulfill the need, not create it, leaving still unanswered the question, 'What is the need the dollars are supposed to fulfill'? ... The concept, basic financial need, presupposes the existence of a basic program need, but the latter has never been defined other than by the former. Herein lies the major problem in defining basic need.[19]

Clearly the sum of money for which the term "basic need" serves as a label has no relation to any district's basic needs as determined by specific services needed by school children. This is true not only in terms of simple definition and logic, but also by virtue of the actual amounts which the formula awards as representing basic need. This is shown vividly by the following chart, also taken from CNER's "A Strategy for Defining Basic Need."[20]

"A Strategy for Defining Basic Need."

Accumulated Expenditures per ADM, City/Borough Districts, FY '75




Here we see that the actual FY '75 average state-wide Basic Need ($1,402), as determined by the formula, fails to cover even the state's average instructional expenses, much less the other basic costs essential to running a school district (e.g., administration, operation and maintenance of plant, auxiliary services, food services, pupil transportation and fixed charges).

To use the word "need" in an allocation formula presupposes that the user can specify the relationship between the human need for a specific level of educational services and their monetary costs. On this issue, even the experts are divided. Indeed, the courts have preferred to interpret equal protection under the law in terms of the inputs to education rather than in terms of its far-harder-to-define outputs (and clearly not in terms of the human needs which those outputs may or may not satisfy).[21]

In short, the fundamental ambiguities associated with the term "basic need" both conceptually and operationally argue strongly for its being replaced. Because what we are in fact dealing with is a foundation of monetary inputs and because the people in Alaska themselves already refer to their school finance system as a "foundation plan," the term "foundation level" appears to be a sensible candidate for such a replacement.

Minimum Level of State Support of Basic Need (ML)[22]

This fraction, presently set by state law at 0.95, represents that minimum portion of a given district's basic need which is to be funded by the state. Or, in a legal sense, the state is required by law to fund at least 95 percent of a given district's basic need. Although Alaska prides itself on funding so large a share of basic need, one

should be careful to recall, as we saw above, that the state-wide average for basic need, as determined by the formula, falls far short of those costs which are most basic to keeping the schools open. Also, in order to incorporate the fact that the "minimum level" is actually a proportion or percentage, the author suggests that it be modified slightly to "minimum proportion" or "minimum percentage."

Property Valuation per ADM for District "i" ($PV_i$)

According to Sec. 14.17.021, part C.3 of the Alaska Statutes, this variable represents the "full and true value of taxable real and personal property within the district, divided by the average daily membership of that district."

In focusing this report on the formula itself, the singularly important and vast area of property valuation, assessment ratios, and state-level correction for assessment ratios has not been investigated. In this author's opinion, an area so ripe with potential for inequity in school finance warrants a separate research effort.

It also should be noted that Alaska is probably unique relative to all the other states inasmuch as its Regional Educational Attendance Areas (as distinct from City and Borough Districts) have no assessed valuation whatsoever from which to obtain local funding. The net result is that schools in these areas simply generate no local support (though on the average they receive substantially more state aid per ADM than do their City and Borough counterparts).

Average Property Valuation per ADM for the State as a Whole ($PV_s$)

The variable $PV_s$ is simply the average of the $PV_i$'s defined above weighted by each district's respective total ADM. The mathematics of arriving at this average are such that if the average were multiplied by the total number of ADM corresponding to the districts involved, the resulting product would equal the state-wide total property valuation.

Equalized Percentage for District "i" ($EP_i$)

"Equalized Percentage" is an intermediary value which, as indicated by the last bracket above the formula, is equal to $(1 - (1 - ML)PV_i/PV_s)$. The resulting quantity expresses that fraction (not the percentage!) of Basic Need which will be funded by the state.[23] Since the minimum level fraction, ML, remains constant over all districts, this Equalized Percentage (or better, equalization fraction, or factor) is most importantly a function of the given district's average property value per ADM relative to the state-wide average. When district "i"'s property valuation is equal to or greater than the state average property valuation, the state is obligated to fund only the "minimum level." That is, when the ratio $PV_i/PV_s$ takes on a value of one or greater, it is replaced by the value one, and the equalized percentage becomes $1 - (1 - ML)$, which in turn

is simply equal to ML. Since ML equals 0.95, average or above-average wealth districts receive only 0.95 of their formula-determined Basic Need. Poorer districts, on the other hand, receive a larger fraction, depending on where their assessed valuation falls below the state-wide average. Here, it should be emphasized, the formula is not substantially wealth equalizing. Wealthy districts will always receive at least 95 percent of their Basic Need regardless of how wealthy they are! Moreover, for a poor district to receive 100 percent of its Basic Need, it must, according to the mathematics of the formula, have a property valuation of zero dollars and not a penny more! And even if a poor district were able to surmount the mathematical barrier to obtaining 100 percent of Basic Need, we saw on page 17 that the number of dollars which the state-wide average for Basic Need represents still fails to cover even the most basic of all district costs. The question of what to do about differences in local wealth as well as local tax rates is more appropriately discussed in the chapter devoted to reform (Chapter IV).

Required Local Effort for District "i" ($RLE_i$)

With regard to Required Local Effort, Sec. 14.17.071 of the state law reads:

> (a) Payment of state aid to a local school district under this chapter is contingent upon matching by the district in the amount of the required local effort for that district in the ratio of required local effort: state contribution = 1:Pi/(1-Pi).
>
> (b) For purposes of this section, Pi = equalized percentage as defined in Sec. 21X (c) of this chapter.[24]

If we look at the formula appearing below the state aid formula on page 5 and bear in mind that the formula-determined Basic Need for a given district will always be equal to or greater than that district's formula-determined state entitlement, then Required Local Effort is most simply pictured as merely Basic Need minus State Entitlement.[25] Although the law appears to be quite explicit in stating that state aid is contingent upon the district's providing the specified Required Local Effort, this contingency is sometimes ignored. In fact, in 1975-76, the City Districts of Kake, Klawock, and Pelican did not meet their obligation and were nonetheless given their full state entitlements.[26]

## Chapter III

## HOW THE CURRENT FORMULA WORKS: A NUMERICAL EXAMPLE[27]

With a better understanding of the meaning behind each of the formula's variables, we are ready to substitute realistic numbers into these variables in order to grasp how that formula works. Let us assume that our district's respective ADM counts for elementary (including kindergarten and pre-elementary), secondary, vocational education, special education, and correspondence education were such that in reading the Instructional Units tables for each of these categories, those ADM's translated into a grand total of 42 Instructional Units (or, in the author's terms, "classroom equivalents"). Let us assume also that our district costs relative to the costs in other districts were such that the state gave us an Instructional Unit Allotment ("cost index") of 107.5 percent. Now if our Base Instructional Unit ("base classroom equivalent cost") is $25,000, we have now enough values to calculate our Adjusted Instructional Unit Value ("adjusted classroom-equivalent cost") as well as our Basic Need. Recalling the state aid formula, we have:

$$SA_i = \overbrace{IU_i \times \underbrace{BIU \times IUA_i \times IF_i}_{IUV_i}}^{BN_i} \times \frac{EP_i}{(1 - (1-ML) \times PV_i)}{PV_s}$$

And in the example described above, the variables under the Basic Need bracket take on the values:

$$IU_i = 42$$
$$BIU = \$25,000$$
$$IUA_i = 1.075$$
$$IF_i = 1.05$$

Multiplying the last three values times one another yields our Instructional Unit Value:

$$\begin{aligned} IUV_i &= BIU \times IUA_i \times IF_i \\ &= \$25,000 \times 1.075 \times 1.05 \\ &= \$28,218.75 \end{aligned}$$

And multiplying this Instructional Unit Value ($IUV_i$) times our Instructional Units ($IU_i$) gives us our value for Basic Need:

$$\begin{aligned} BN_i &= IU_i \times IUV_i = (IU_i \times BIU \times IUA_i \times IF_i) \\ &= 42 \times \$28,218.75 \\ &= \$1,185,187.50 \end{aligned}$$

Now just how much of our Basic Need the state will provide, and how much of it we must provide from local sources, requires the calculation of the Equalized Percentage ("equalization factor") which, in turn, requires knowledge of (1) the Minimum Level, (2) our district's assessed Property Value per ADM, and (3) the state-wide average of assessed Property Value per ADM.

Assuming values of 0.96 for the Minimum Level, $72,149 for our district's Property Value per ADM, and $86,614 for the state-wide average of per ADM Property Value, our Equalized Percentage becomes:

$$EP_i = 1 - (1-ML) \times \frac{PV_i}{PV_s}$$

$$= 1 - (1-.95)\ \$72,149/\$86,614$$
$$= 1 - (.05)\ (.8330)$$
$$= 1 - .04165$$
$$= 0.95835$$

The Equalized Percentage value of .9584 for our district indicates that the state will fund only that fraction (not that "percentage") of our Basic Need. That is, multiplying our Equalized Percentage fraction times our Basic Need gives us the amount of formula-determined state aid to which we are entitled:

$$SA_i = BN_i \times EP_i$$
$$= \$1,185,187.50 \times 0.95835$$
$$= \$1,135,824.44$$

And subtracting this state aid from our Basic Need indicates the magnitude of our Required Local Effort:

$$RLE_i = BN_i - SA_i$$
$$= \$1,185,187.50 - \$1,135,824.44$$
$$= \$49,363.06$$

According to law, if our district can come up with the $49,363.06, it is entitled to the $1,135,824.44 in formula-determined state aid.

# Chapter IV

## TOWARDS REFORM

### A Goal Formula

Rather than continue with piecemeal suggestions for modifying the present formula, what is likely to be more useful is to outline a "goal formula"; that is, a construct aimed at solving each of the eight major problems described in Chapters I and II, and towards which, politics permitting, the present formula can evolve.

In this author's opinion, the very special school finance challenges specific to Alaska can be more simply handled with only three fundamental variables. Two of those variables relate to those two uncontrollable factors which most influence the actual costs of a child's education in Alaska. They are: (1) school size (i.e., lower per-child costs the larger the enrollment), and (2) inter-district differences in the costs of goods and services (though primarily a function of distance from major population centers, this is also likely to be a complex function of supply and demand forces in a host of different markets). The third variable aims at solving problems of taxpayer equity and fiscal neutrality while still preserving local control over expenditures. The goal formula incorporating these features appears as follows:

The Goal Formula

$$SA_i = (\$/ADM_i) \times (ECI_i) \times (LOM_i)$$

where:
- $SA_i$ = State Aid per ADM to district "i"
- $\$/ADM_i$ = Dollars per ADM for district "i" (i.e., this represents a school size factor/economies of scale factor)
- $ECI_i$ = Education Cost Index for district "i" (to capture inter-district differences in uncontrollable education costs)
- $LOM_i$ = Local Option Multiplier for district "i" (to equitably permit larger expenditures per ADM for districts willing to tax themselves at higher rates).

This formula is probably best described in the same manner in which we critiqued the last; that is, by dissecting it and discussing each of its components from left to right.

### State Aid Per ADM to a Given District "i" ($SA_i$)

Unlike the formula discussed earlier, which gave us the absolute quantity of state aid to a given district, the formula suggested here presents state aid to the district in per ADM terms. The distinction is significant. In light of the fact that the "goal formula" shifts the unit of analysis away from hypothetical classroom units (i.e., Instructional Units) to individual students, the formula is easier to con-

ceptualize in per-ADM terms. Of course, absolute state aid can be quickly determined from the goal formula by simply multiplying the state aid per ADM figure yielded by the formula, times the given district's ADM level.

Dollars Per ADM for a Given District "i" ($/ADM$_i$)

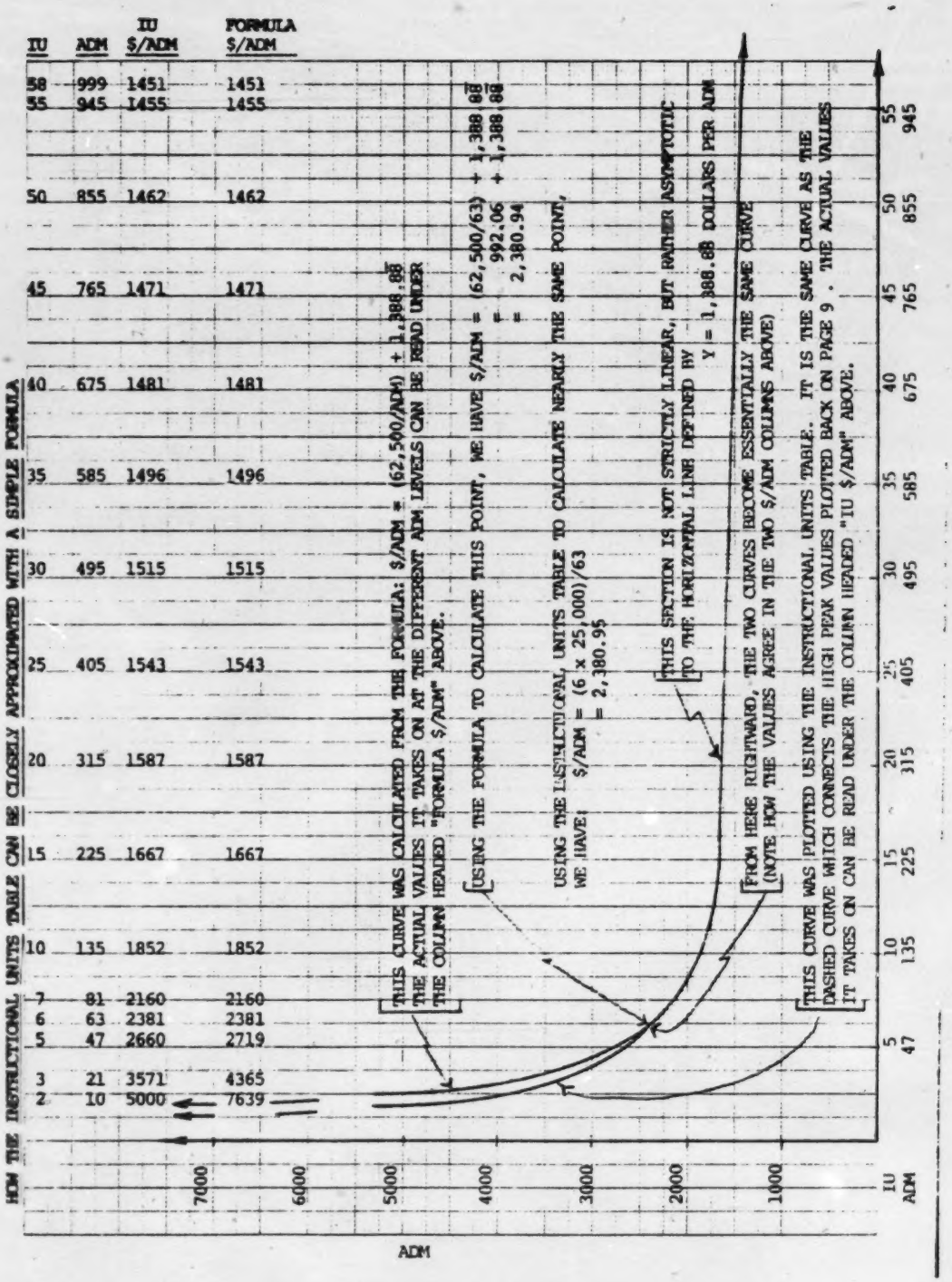
A well known phenomenon in the fields of business and economics is that of "economies of scale." Economies of scale simply means that the per unit cost of a given product will decline with increases in the absolute quantities of the product being produced. As can be seen in the successively declining peak values of the graph on the bottom of page 9 , the framers of the instructional units table allowed for this very phenomenon--and with good reason. All other things being equal, it simply costs more on a per-child basis to provide education for a village containing only 10 children than it does for a large city like Anchorage. In the case of the large city, capital outlay as well as administrative and instructional services are simply divided among far more students than they are in the case of the village. The result is lower per ADM costs (and, in most cases, higher per ADM levels of educational services!). In short, the $/ADM variable is aimed at allowing for the uncontrollable influence which economies of scale exert on per ADM costs. Rather than advocating continued reliance on the instructional units table, either as it is used today or as it might be smoothed along peak values according to the formula on page 9 , what is suggested here is a complete breakaway from the instructional units concept.

As can be seen in the graph on the following page, the curve which connects the peak values derived from the instructional units table (i.e., the dashed curve on the bottom of page 9 ) can be very closely approximated by a simple economies-of-scale formula which ignores the instructional units table altogether. That formula appears as follows:

$$\$/ADM = (62{,}500/ADM) + \$1{,}388.88$$

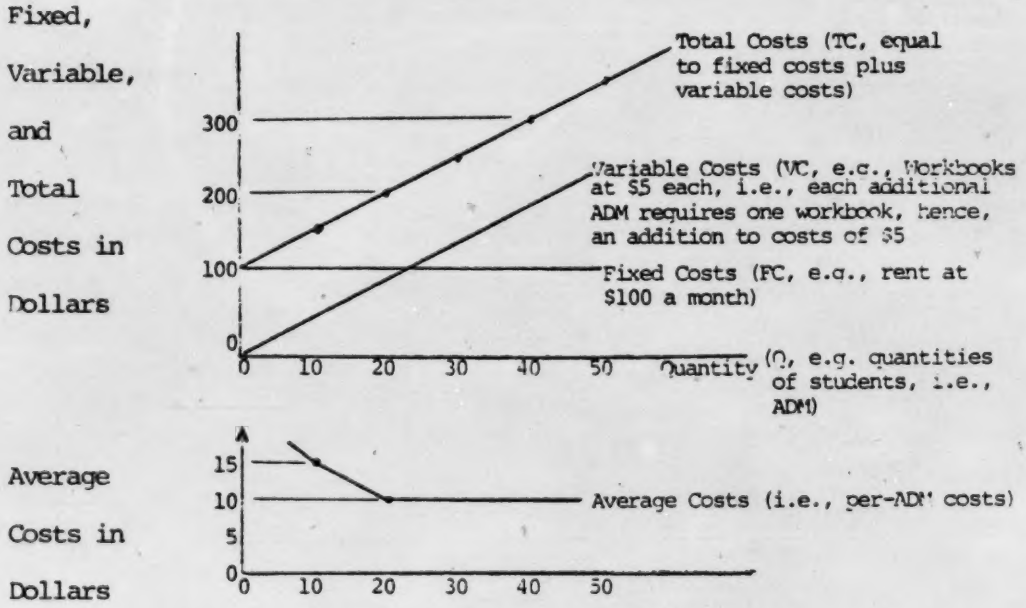
The column of numbers headed "FORMULA $/ADM" represents the $/ADM values generated by this economies-of-scale formula at the different levels of ADM, for the entire range (0 - 999) of the Instructional Units Table. The column headed "IU $/ADM" represents the $/ADM values arrived at using the peak values associated with that table. Viewing not only the two columns but also the two converging curves plotted from those two columns, it becomes clear that for ADM values of 50 or larger, the simple economies-of-scale formula does quite well at fitting itself to the instructional units approach. For values of less than 50, our economies-of-scale formula argues for higher per ADM costs than what is given by the instructional units approach--a proposition which, as we will attempt to show below, could more closely approach the real-world phenomenon than the instructional units construct.

# HOW THE INSTRUCTIONAL UNITS TABLE CAN BE CLOSELY APPROXIMATED WITH A SIMPLE FORMULA


HOW THE INSTRUCTIONAL UNITS TABLE CAN BE CLOSELY APPROXIMATED WITH A SIMPLE FORMULA
IU
ADM
IU $/ADM
FORMULA $/ADM
58 999 1451 1451
55 945 1455 1455
50 855 1462 1462
45 765 1471 1471
40 675 1481 1481
35 585 1496 1496
30 495 1515 1515
25 405 1543 1543
20 315 1587 1587
15 225 1667 1667
10 135 1852 1852
7 81 2160 2160
6 63 2381 2381
5 47 2660 2719
3 21 3571 4365
2 10 5000 7639
THIS CURVE WAS CALCULATED FROM THE FORMULA: $/ADM = (62,500/ADM) + 1,388.88
THE ACTUAL VALUES IT TAKES ON AT THE DIFFERENT ADM LEVELS CAN BE READ UNDER THE COLUMN HEADED "FORMULA $/ADM" ABOVE.
USING THE FORMULA TO CALCULATE THIS POINT, WE HAVE $/ADM = (62,500/63) + 1,388.88
= 992.06 + 1,388.88
= 2,380.94
USING THE INSTRUCTIONAL UNITS TABLE TO CALCULATE NEARLY THE SAME POINT, WE HAVE: $/ADM = (6 x 25,000)/63
= 2,380.95
THIS SECTION IS NOT STRICTLY LINEAR, BUT RATHER ASYMPTOTIC TO THE HORIZONTAL LINE DEFINED BY Y = 1,388.88 DOLLARS PER ADM
FROM HERE RIGHTWARD, THE TWO CURVES BECOME ESSENTIALLY THE SAME CURVE (NOTE HOW THE VALUES AGREE IN THE TWO $/ADM COLUMNS ABOVE)
THIS CURVE WAS PLOTTED USING THE INSTRUCTIONAL UNITS TABLE. IT IS THE SAME CURVE AS THE DASHED CURVE WHICH CONNECTS THE HIGH PEAK VALUES PLOTTED BACK ON PAGE 9 . THE ACTUAL VALUES IT TAKES ON CAN BE READ UNDER THE COLUMN HEADED "IU $/ADM" ABOVE.
7000
6000
5000
4000
3000
2000
1000
ADM
IU
ADM
55 945
50 855
45 765
40 675
35 585
30 495
25 405
20 315
15 225
10 135
5 47

The economies-of-scale formula is really nothing more than an average-cost curve derived from the basic theory behind fixed, variable, total, and average costs. Any business endeavor experiences what are known as "fixed costs"--those costs which remain constant regardless of the level of production (e.g., the rent of a building). Added to those fixed costs are variable costs, those costs which vary with production levels (e.g., the cost of materials used up on each student, i.e., the cost of a spelling workbook). The firm's total costs are simply equal to its fixed plus its variable costs. For example, if we assumed that educational costs consisted of only the cost of building rental and student workbooks, a plot of our total costs might look like the following:

FIXED, VARIABLE, TOTAL, AND AVERAGE COSTS




The average cost curve shown on the bottom graph is calculated simply by dividing total costs by the respective quantities of students measured on the horizontal axis which correspond to those total costs. In terms of fixed and variable costs, the formula for the average cost curve is:

$$AC = (FC + VC)/(Q)$$

Where: AC = Average Costs
FC = Fixed Costs
VC = Variable Costs
Q = Quantity

But since variable costs rise in proportion to quantity Q, we can replace VC with a constant times Q (e.g., in our plotted example, VC = $5 x Q).

This constant can be viewed as the additional cost of an additional student, or in the jargon of the economists, the "Marginal Cost" (MC). Plugging in (MC x Q) for VC, we have:

$$AC = (FC + MC \times Q)/Q$$

and dividing through by Q gives us:

$$AC = (FC/Q) + MC.$$

Note that the form of this average cost function is precisely identical to the form of our economies-of-scale formula presented back on page 24:

$$\$/ADM = (62,500/ADM) + \$1,388.88$$

Average costs, AC, are dollars per ADM ($/ADM); fixed costs, FC, are equal to $62,500; quantity, Q, is Average Daily Membership (ADM); and finally, Marginal Costs are equal to $1,388.88. Recalling the comparison of the two curves on page 25, we saw that through roughly 95 percent of the ADM range of 0 to 999, the two curves are nearly identical. This observation, combined with the derivation above, leads us to conclude: the instructional units table used to calculate the one curve implicitly assumed fixed costs of $62,500 and marginal costs of $1,388.88. The only reason the two curves diverge for low levels of ADM is because in the Instructional Units Table, the ADM intervals are unequal for low levels of ADM. Indeed the economies-of-scale function may yield dollar-per-ADM values which more closely approximate the actual economies of scale faced by Alaska's schools.

Returning now to the use of the $/ADM variable in our goal state aid formula, the value for this variable for a given district will be calculated from the economies-of-scale function by plugging in the district's "grand total" of ADM; i.e., the sum of its ADM over its different--and differently weighted--categories of ADM. For example, vocational education ADM would presumably be weighted more than regular education ADM since vocational education programs generally cost more than the regular education programs.[28] A weight per ADM for each category would be established most wisely on the basis of actual costs, whereby the effects on costs of being in a particular category could be isolated, using Analysis of Variance techniques.[29]

Finally, although it is quite clear from the coincidence of the two curves on page 25 that the $/ADM function was constructed from the contents of the Instructional Units Tables, the $/ADM curve of the future needn't have any link to the Instructional Units Table whatsoever. Better would be to begin with the instructional units-related $/ADM function, and then over the years, modify it so it agrees more accurately with actual fixed and variable costs.

Education Cost Index for a Given District "i" ($ECI_i$)

Replacing the Instructional Unit Allotment as well as the Isolation

Factor, the Education Cost Index allows for interdistrict differences in uncontrollable supply-side influences (discussed in Chapter II) on the costs of educational goods and services. The challenge of isolating the relevant supply-side influences, and then incorporating them into a district index which accurately reflects the uncontrollable costs of that district relative to all districts, is best left to an experienced economist, competent in the methodology of index preparation. To this author's mind, the two major components of such an index should be: (1) transportation costs between the district and its nearest major city supply center (thus including the notion of isolation); and (2) the estimated supply schedule of fully qualified teachers (i.e., for different salary rates, the quantities of fully qualified teachers willing to offer their services to the district at each of those rates). Household cost-of-living indices should not be included, because it is a school district and not a household which is making the expenditures for goods and services. Besides, such cost-of-living indices would only be redundant since their most relevant components are already captured in our consideration of transportation costs and teacher-supply schedules (i.e., it is the teachers who must consider the household cost of living in a district before choosing the salary rate at which they will be willing to offer their services). Rather than continue with what could well turn out to be a lengthy treatise on the problems and complexities of creating cost-of-education indices, a list of readings on the subject is offered.[30]

Local Option Multiplier for a Given District "i" ($LOM_i$)

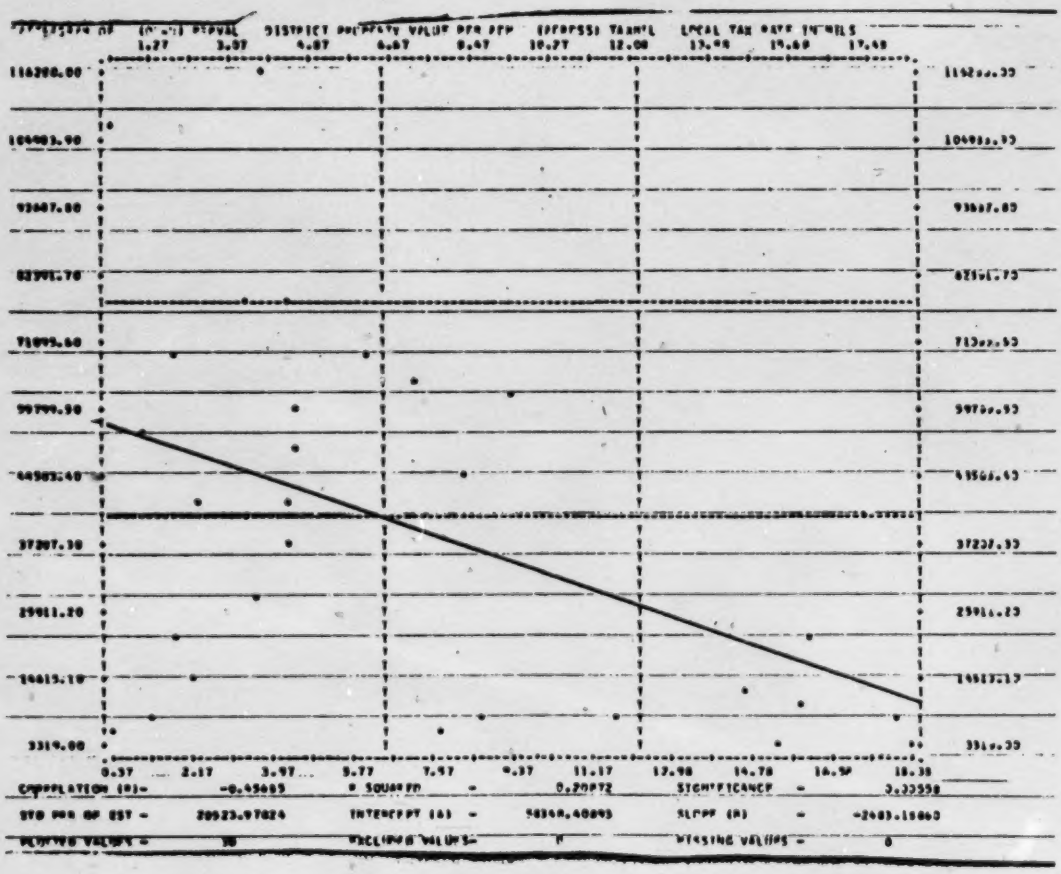
Earlier we saw that the equalized percentage feature of the present state aid formula was not substantially equalizing. That is, (1) it only equalizes within a range of five percent of Basic Need, thus permitting even the wealthiest of districts to receive at least 95 percent of their Basic Need; (2) in order for the state to fully fund Basic Need, a district must have zero property value, and not a penny more, and finally, (3) in the rare event that a district did receive full funding of Basic Need, we saw that the sum of money represented by Basic Need failed to cover the state-wide average costs of even the most basic budget items (e.g., instructional expenses, to say nothing of operation and maintenance of the physical plant, food services, pupil transportation, fixed charges, and more).

In short, the local option multiplier aims to resolve the above while preserving local control over expenditures, and at the same time tackling the significant problem of taxpayer inequity--a problem which the present formula neglects altogether.

What is meant by the problem of taxpayer inequity? The scatterplot on page 29 should be instructive. On the vertical axis is plotted actual 1975-76 property valuations per ADM against a horizontal axis which indicates tax rates in mils. (North Slope is omitted from this plot because its assessed valuation of $238,474 per ADM--more than double the maximum on our scatterplot--distorts the picture wildly. The extraordinary data

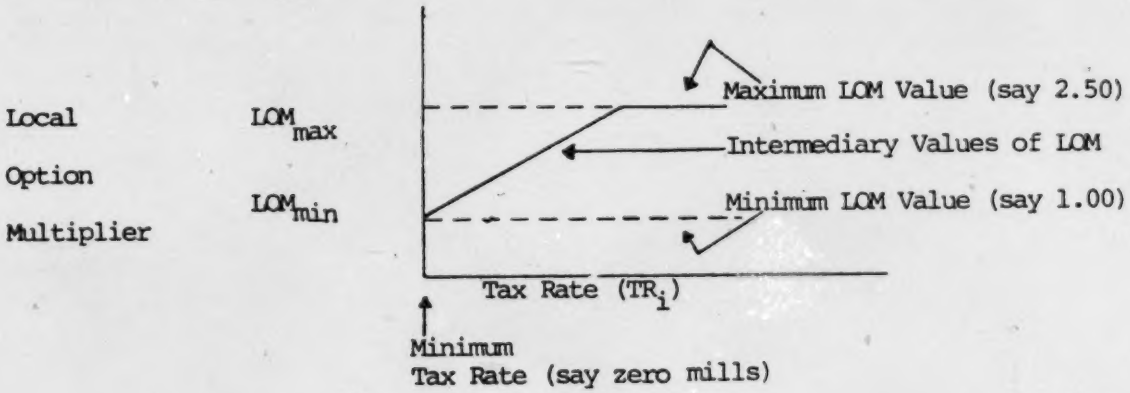
point which would be plotted by North Slope's inclusion is what statisticians legitimately exclude as an "outlier".) Moving from left to right along the downward sloping trend line, it becomes clear that in general property-rich districts have low tax rates while property-poor districts must tax themselves heavily in order to meet local educational needs. (The correlation coefficient of minus 0.45685 printed at the lower left-hand corner of the scatterplot confirms the statistically significant inverse relationship between wealth and tax rates in Alaska.) This inverse relationship between wealth and tax rates is what is meant here by "taxpayer inequity."

SCATTERPLOT OF DISTRICT PROPERTY VALUE PER ADM VERSUS
LOCAL TAX RATE IN MILLS



One means of solving the taxpayer inequity problem is to construct a situation in which equal tax rates yield equal revenues per ADM regardless of local wealth per ADM. Such a structure forces expenditures to be insensitive, or "neutral" with respect to local district wealth. Indeed, this condition is what the finance experts refer to as "fiscal neutrality,"[31] and it is this condition which the LOM function satisfies.

Just how does the $LOM_i$ work in the goal formula? The value of the $LOM_i$ for a given district "i" will be a linearly increasing function of that district's self-imposed, property-equivalent tax rate. Graphically, that function appears as follows:




$LOM_{min}$ represents the minimum value which LOM could take on (probably very close to 1.0), whereas $LOM_{max}$ represents its maximum value (clearly a political decision to be made within real-world tax revenue constraints). Mathematically, the LOM function can be written as follows:

$$LOM_i = (LOM_{min}) + (SLOPE) \times (TR_i)$$

where the variable SLOPE represents the value of the slope of the slanted LOM line segment (clearly a positive number), the $TR_i$ equals the given district's tax rate.[32] The higher the district's tax rate, the higher the district's Local Option Multiplier. Recalling our goal formula, we see that the larger the district's Local Option Multiplier, the larger will be its state aid in proportion to its particular level of uncontrollable costs per ADM (as determined by our $\$/ADM_i$ and our $CI_i$ variables). In essence, the Local Option Multiplier gives districts the option of increasing their revenues per ADM regardless of assessed valuation per pupil and in proportion to the rate at which those districts will be willing to tax themselves. What is more, it guarantees for every district equal proportional revenue increases per ADM for equal tax rates, thereby achieving property taxpayer equity.[33]

The slope of the LOM function is selected such that the rich district's property tax revenues which exceed that amount which the LOM function would add are redistributed to the poor districts whose property tax revenues have falled short of their LOM-determined increase. To make the politically thorny redistribution more palatable, a gradual phase-in scheme has been developed by this author in work for the State of California.[32]

## Chapter V

### HOW THE GOAL FORMULA WORKS: A NUMERICAL EXAMPLE

To demonstrate how the goal formula would translate the above district statistics into a final quantity of state aid dollars, we have chosen numbers which parallel those used in the numerical example of the present state aid formula, given earlier on pages 21-22. The parallel results should allay fears that a new and different goal formula might radically jumble the levels produced by the old formula.

We begin by assuming that the weighted sum of our district's regular, vocational education, and special education ADM equals 711. Plugging this value into our economies-of-scale formula in order to obtain the dollars per ADM required by a district of our size, we have:

$$\begin{aligned} \$/ADM &= (62{,}500/711) + 1388.88 \\ &= 87.90436 + 1388.88 \\ &= 87.90436 + 1388.88 \\ &= \$1{,}476.793249 \end{aligned}$$

In words, our economies-of-scale formula tells us that a district operating on a scale of 711 ADM has costs, due to the size alone, of $1,476.793249 per ADM.[34]

Next, we assume the economists have given our district a cost index of 1.12875, implying that uncontrollable costs are 12.875 percent higher in our district than they are for the baseline district. Multiplying by the index, we have what we might call our cost-adjusted dollars per ADM:

$$\begin{aligned} \text{Cost Adjusted Dollars Per ADM} &= \$1{,}476.78 \times 1.12875 \\ &= \$1{,}666.93038 \end{aligned}$$

Noting that this is a per ADM figure, we multiply it times our ADM of 711 to obtain our base amount of state aid prior to local option add-ons:

$$\begin{aligned} \text{Base state aid prior to increases from the local option multiplier} &= \$1{,}666.03038 \times 711 \\ &= \$1{,}185{,}187.50 \end{aligned}$$

If we turn back to the numerical example of Alaska's present formula (p.5 ), we see that this figure of $1,185,187.50 agrees to the penny with the figure calculated as basic need in the first example. Although the careful reader might think that the cost index was juggled to make things work out the author's way, the reader can easily verify that the cost index of this example is merely the product of the two cost indices of the last; i.e., the product of the instructional unit allotment and the isolation factor (IUA = 1.075) x (IF = 1.05) = (CI = 1.12875). The reader can also see, from the Instructional Units Table presented on page 6 , that the 42 instructional units used in our earlier example correspond precisely to the peak ADM value of 711 used in the example here.

Despite the curious numerical equalities pointed out above, the conclusion that given equal inputs the formula will always yield identical outputs is erroneous. The reader is reminded that the goal formula has a smooth $/ADM function while the present formula is plagued with peaks and troughs. Secondly, the distinctly different approach by which the cost indices in the goal formula are to be obtained is likely to yield cost indices which differ from the present Instructional Unit Allotments and Isolation Factors.

However, the major numerical differences between the two formulae will doubtless stem from the local option multiplier. If we are to assume that the minimum value for our multiplier is 1.0 for local tax rates of zero, and our district chooses a tax rate of zero, then multiplying our base of $1,185,187.50 times our local option multiplier leaves that base unchanged as the final computation of state aid. If, on the other hand, we chose to tax ourselves at 5.0 mills (or the equivalent of 5 mills in terms of local sales taxes, fees, etc.) and the slope of the LOM function was legislated to equal 20.0 that year, then our local option multiplier would be calculated as follows:

$$\begin{aligned} LOM_i &= LOM_{min} + (SLOPE) \times (TR_i) \\ &= 1.0 = (20.0) \times (0.0050) \\ &= 1.0 + 0.10 \\ &= 1.10 \end{aligned}$$

A local option multiplier of 1.10 informs us that as a result of our willingness to tax ourselves at 5.0 mills, we are to receive 10 percent more state aid than we would have in the case of our choosing a tax rate of zero. The final allocation then, for our hypothetical district, is $1,185,187.50 x 1.10= 1,303,706.25. To see this in the terms of the per ADM goal formula, we have:

$$\begin{aligned} SA_i &= \$/ADM \times CI_i \times LOM_i \\ &= 1,476.793249 \times 1.12875 \times 1.10 \\ &= \$1,833.623418 \text{ per ADM.} \end{aligned}$$

Multiplying this by our ADM of 711, the result agrees to the penny with the $1,303,706.25 found above.

# Chapter VI

## CONCLUSION

It is hoped that the foregoing has demonstrated (1) that the formula presently used for the distribution of state aid to local school districts in Alaska is in fact deficient in at least eight distinct areas, (2) that those eight deficiencies can be remedied by a simpler goal formula, and finally, (3) that such remedies need not yield radical shifts in the present levels of state aid and thereby need not meet with overwhelming pro-status-quo political resistance (though funding levels for all districts will rise if our $/ADM function is constructed from the peak rather than trough values derived from existing Instructional Unit Tables).

### Goal Formula Remedies

How has the goal formula attempted to remedy the deficiencies? Let us review them one by one:

1. Most of the terms used to describe the component variables of the formula contain very little meaning relative to what it is they actually attempt to label. By purging the majority of the variables altogether, by substantially modifying the structural content of others, and by introducing a completely new set of variable labels, selected to be relevant to the quantity they describe, the goal formula at least embodies a conscious effort to solve the relevant-labels problem.

2. The structure of the formula is unnecessarily complicated. Although both the goal formula and the formula presently used have much hiding behind their basic variables (e.g., the $/ADM function in the former versus the Instructional Units Table in the latter), overall, the goal formula appears to be simpler. The goal formula merges two cost indices into one (i.e., the isolation factor and the instructional units allotment become the education cost index). The instructional units table becomes a simple function, depictable with a single equation. Finally, several operations required to calculate the equalized percentage in the current formula are replaced by the LOM function in the goal formula. It should be noted that the movement toward simplicity sought by the goal formula has remedied, not accentuated, other problems with the present formula.

3. The formula provides strong economic incentives for districts to redistribute either ADM counts or actual children from one school to another in order to maximize state aid. By removing altogether the peaks and troughs associated with the instructional units table, the incentives for redistributing children are removed. Furthermore, this is done in a way which is likely to get the support of educators since it means more state money for them (i.e., if the $/ADM function is constructed from peak

values associated with the existing Instructional Unit Tables). Finally, the advocated replacement for the instructional unit table, the $/ADM function, brings the formula closer to economies-of-scale realities as well as to the relationship of those realities to actual fixed and variable costs.

4. The portion of the formula devoted to equalization vis-a-vis local property wealth appears to be token at best. The equalized percentage component of the present formula has been replaced in the goal formula with the concept of the local option multiplier (LOM). By compensating districts equally according to the rates at which they choose to tax themselves, this local option multiplier severs the linkage between local property wealth per ADM and local per ADM tax receipts. This modification not only makes wealth equalization complete, but in addition has the politically desirable feature of preserving local control over district expenditure levels beyond the state aid base.

5. The actual fiscal year 1975-76 data confirm that in general, richer districts in Alaska tax themselves at lower rates, and poorer districts tax themselves at higher rates. The same local option multiplier which severed the linkage between local wealth and local expenditures also solves the tax equity problem. With the local option multiplier, richer districts will not be permitted to receive larger amounts of local revenue at low tax rates while poorer districts tax themselves at much higher rates for smaller receipts. More specifically, this modification in the present formula effectively guarantees that, all else being equal, equal tax rates from district to district will yield equal local revenues per ADM.

6. The formula's cost indices embody no effort, implicit or explicit, to isolate and then compensate districts according to uncontrollable supply-side influences on costs. Although this report urged that the preparation of education cost indices be the job of an experienced economist, it also urged that isolating uncontrollable influences on education costs be that economist's primary objective. Furthermore, the wide-ranging differences in costs of transportation and differences in district teacher-supply schedules were suggested as the two most important components of such indices. The alternative to an isolation-of-uncontrollables approach is a system in which districts are likely to be rewarded for failure to control costs where in fact those costs can be controlled.

7. By grouping districts and then assigning a single cost index (Instructional Unit Allotment) to each group, the formula neglects the likelihood that real uncontrollable costs are (1) unique for each district (if not for each school) and (2) widely varied among districts (if not among schools). The goal formula elim-

inates potential inequities here by incorporating a single education cost index for each district according to the given district's unique levels of uncontrollable costs.

8. The five-percent-or-nothing character of the Isolation Factor neglects the wide range of gradations in the actual district-to-district costs of being isolated from the major population/supply centers of Alaska. An independent variable aimed at accounting for the isolation or non-isolation of a given district does not appear in the goal formula. Rather, the entire range of actual transportation-cost differentials which arise from different degrees of isolation is captured by the goal formula's education cost index. In fact, it is urged here that transportation cost differentials be a major determinant of the education cost index since such differentials (themselves a function of degrees of isolation as well as of other variables specific to the district) are thought to be a major uncontrollable supply-side influence on Alaska's education costs.

On Implementation

Despite the above pro-goal formula comparisons, the goal formula should not be viewed as "the panacea" for all Alaska's school finance problems. Roughly 90 percent of the success of any substantial political change is determined by personal attitudes toward that change and the care with which the change is implemented. Too hasty a launching of any goal formula ideas upon a rough sea of attitudinal resistance could well wreck the chances of ultimate implementation. Noting the apparently wide-spread pro-status-quo orientations toward the existing formula, the last thing desired is to trigger chaos for the prospect of "instant reform." On the contrary, the intention of the foregoing is merely to point out deficiencies in the existing state aid formula and to suggest a goal toward which, given incremental implementation, those deficiencies can be effectively and permanently reduced or eliminated. The key word in the fulfillment of such a goal is "incremental." Every feature of the goal formula can be phased in and adjusted such that any redistributional impact can be spread over a number of years. Furthermore, the fact that the goal formula argues for a smoothing at the peaks rather than at the troughs (discussed in Chapter II) suggests that the redistributional impacts will be positive in the cases of most, if not all, districts. More precisely, the goal formula makes it mathematically impossible for any district to fall as much as a penny below a peak value on the dollars-per-ADM function. Because all districts will be on a peak value, all districts will receive higher levels of unadjusted dollars per ADM than they do under the present system. This is especially significant when we note that according to multiple-regression analysis of the data for the 1975-76 fiscal year, unadjusted dollars per ADM exert a greater influence on the final per ADM state aid (as well as on overall per ADM expenditures) than all the other variables combined.

Formulas and Automobiles

Historically, the evolution of school finance formulae can be seen as analogous to what occurs for most people in their ownership of an automobile. As long as the vehicle accelerates when the accelerator is depressed, most of us remain satisfied with its performance. Understandably, few of us really wish to concern ourselves with the mechanical components of the engine until a failure in one of them loudly comes to our attention or inhibits our travel somehow.

Although similar in this respect of inevitable neglect, the implementation of state aid formulae is quite a different matter than the implementation of engines in automobiles. A most significant difference is that the desired outputs of a school finance formula--competence in the three R's, political awareness, enrichment of social skills, and more--are far harder to define, much less to measure, than is the automobile's output. The total long-run human response (or lack of response) of children to different degrees of pushing on the school finance accelerator under different conditions of the "finance engine," may never be known. Regrettably, the best we can do, short of permitting markets to help us,[35] is to regularly inspect that engine with the concern that it be in top condition to take our clients to the desired destination. For in the end, it is not the traveling of geographic distances which is at stake: it is the lives of Alaska's children and the dreams of their parents. To neglect unarguable deficiencies in the vehicle upon which those things depend is to unnecessarily threaten their fulfillment.

## Chapter VII

## A POSTSCRIPT ON THE EFFECTS OF HOUSE BILL 212

On May 19, 1977, the Alaska Legislature enacted House Bill 212 (SCS CSHB 212) which comes fully into effect on July 1, 1978. Because the foregoing critique was written prior to the enactment of the HB 212 school finance measure, an analysis of how HB 212 has altered the formula is warranted.

Although the net effect of HB 212 appears to have been negative, let us begin by discussing what HB 212 may have done to improve the situation characterized by the above eight principal problem areas. Perhaps the most positive achievement of HB 212 is its elimination of the five-percent-or-nothing Isolation Factor. This is accomplished by eliminating the Isolation Factor clause and merging its associated compensation into the Instructional Unit Allotment. The resulting larger allotments, however, still fail to embody any attempt to isolate uncontrollable costs. As we will discuss below, the elimination of our isolation factor has thus occurred at the expense of aggravating our problem of rewarding districts for their failure to control costs which are controllable.

With the exception of its eliminating the Isolation Factor, HB 212 has done nothing to improve the relevant labels problem with respect to any of the formula's variables. And aside from (1) the slight modification of the front ends of the Instructional Unit Tables, (2) the addition of one regional grouping for the Instructional Unit Allotment, and (3) the elimination of the Isolation Factor, the formula remains just as complicated as before. Finally, the problem of grouping districts for their Instructional Unit Allotments remains (although the addition of a ninth group and a widening of the range of allotments could be viewed as a marginal improvement).

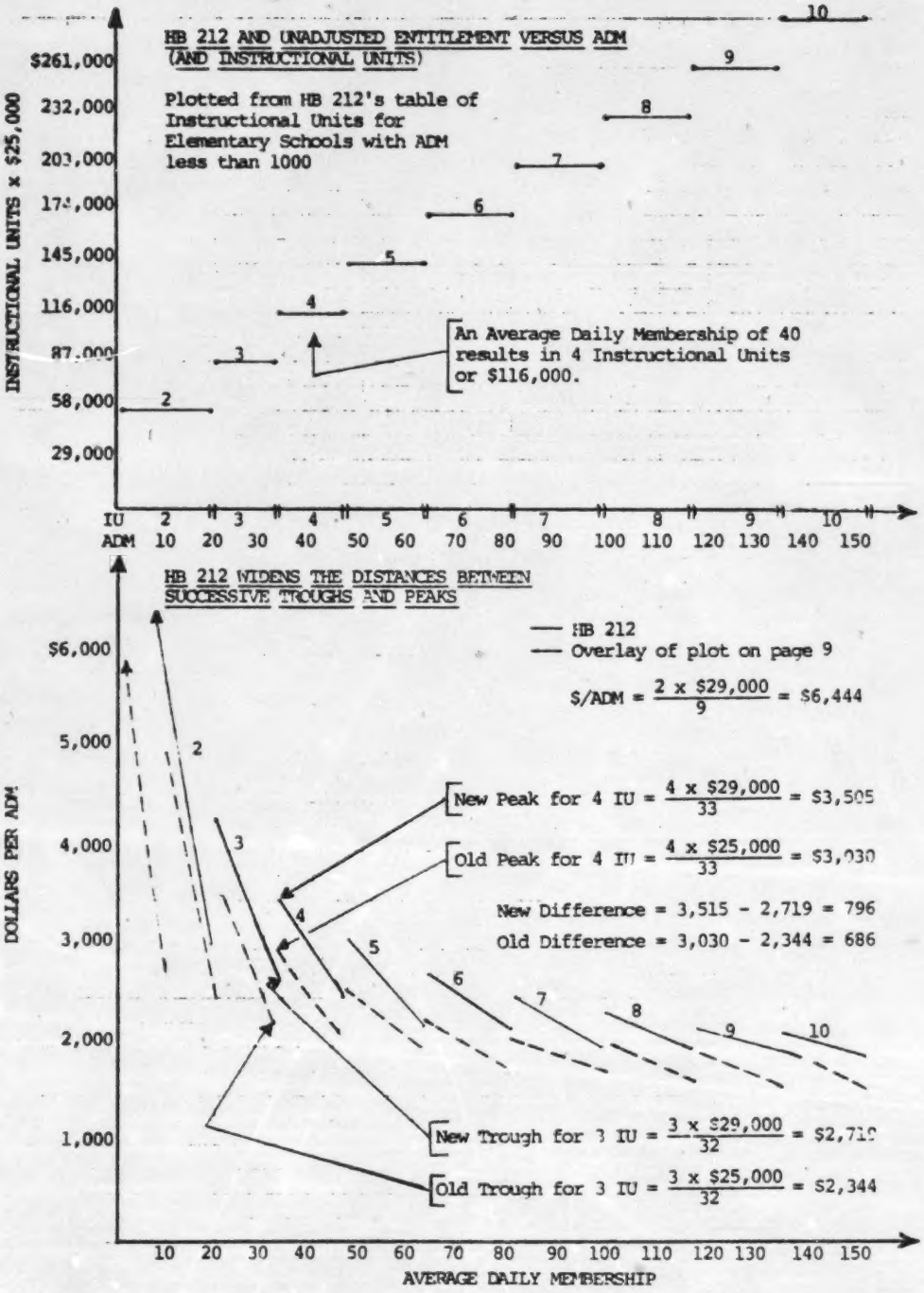
HB 212 has had no explicit direct effect on the problem of richer districts paying lower local tax rates. However, to the extent to which property-rich districts receive substantially increased Instructional Unit Allotments (HB 212 has increased North Slope's Instructional Unit Allotment from 133.75 to 155 percent), and to the extent to which those districts might thereby enjoy downward pressure on tax rates, HB 212 may, in the long run, indirectly lower tax rates for the rich relative to the poor districts.

Directly, HB 212 did more to aggravate than it did to ameliorate at least three of our eight principal problems. To begin, HB 212 increases the share of Basic Need which the state guarantees--from 95 to 97 percent. Recalling the support for our earlier argument that the formula is not substantially wealth-equalizing, we can show that this percentage increase serves to make the formula less wealth-equalizing than before. The already very narrow 5 percent range over which district aid is equalized according to relative wealth has in effect been narrowed still further to only 3 percent. The richest districts in Alaska will now receive what is essentially a flat

grant of at least 97 percent of their Basic Need. For a poor district to receive the maximum of only 3 percent more of its Basic Need than a rich district, the mathematics of the formula continue to stipulate that such a district must be so poor as to have an assessed valuation of zero dollars and not a penny more. In short, rich districts who are able to raise large amounts of local revenue with very small local tax rates are treated nearly identically with poor districts who, if they have anything to tax (e.g., property or sales), must tax it at far heavier rates in order to receive anything near to equal local tax revenue.

In addition to retaining the already criticized practice of grouping unique districts and then assigning a single Instructional Unit Allotment to each group, HB 212 greatly enlarges the allotments (recall that the index for the group includes the North Slope Borough district increases from 133.75 to 155 percent), and therefore the cost-equalizing aid to these groups. By increasing the cost-equalization aid without making any attempt at sorting out controllable demand-side influences on costs, districts who have failed to keep a tight rein on costs where this was possible are in effect being rewarded more now for their failure. We might do well to contemplate the long-term cumulative effect that such generous periodic changes in the law will have on incentives for controlling education costs.

Finally, what appears to have been a good faith effort to at least begin to alleviate the peak/trough problem has resulted in slightly aggravating the problem. Essentially, HB 212 alters the front end of the principal Instructional Unit Tables such that they begin with two instructional units (for elementary schools) or three instructional units (for secondary schools) rather than one. HB 212 also increases the dollar value of each instructional unit to $29,000 as of July 1, 1978. The two plots on the following page illustrate how the new law alters the corresponding plots on page 9 derived from the old law. As can be seen by comparing the dotted curve segments overlayed from the plot on page 9 , with the solid curve segments plotted from HB 212, the peaks and troughs remain. A closer look at the two types of segments reveals that the distances between successive peaks and troughs remain.


HB 212 AND UNADJUSTED ENTITLEMENT VERSUS ADM
(AND INSTRUCTIONAL UNITS)
Plotted from HB 212's table of Instructional Units for Elementary Schools with ADM less than 1000
An Average Daily Membership of 40 results in 4 Instructional Units or $116,000.
INSTRUCTIONAL UNITS x $25,000
$261,000
232,000
203,000
174,000
145,000
116,000
87,000
58,000
29,000
IU
ADM
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
HB 212 WIDENS THE DISTANCES BETWEEN SUCCESSIVE TROUGHS AND PEAKS
HB 212
Overlay of plot on page 9
$/ADM = 2 x $29,000 / 9 = $6,444
New Peak for 4 IU = 4 x $29,000 / 33 = $3,505
Old Peak for 4 IU = 4 x $25,000 / 33 = $3,030
New Difference = 3,515 - 2,719 = 796
Old Difference = 3,030 - 2,344 = 686
New Trough for 3 IU = 3 x $29,000 / 32 = $2,719
Old Trough for 3 IU = 3 x $25,000 / 32 = $2,344
DOLLARS PER ADM
$6,000
5,000
4,000
3,000
2,000
1,000
AVERAGE DAILY MEMBERSHIP

A closer look at the two types of segments reveals that the distances between successive peaks and troughs have actually been enlarged--not reduced--by HB 212. For example, observe the jump from the three instructional unit trough to the four instructional unit peak. For the old law, this represents a jump from $2,344 to $3,030 per ADM, or a net jump of $686 per ADM. However, for the same ADM values, yet subject to HB 212, this results in a jump from $2,719 to $3,515 per ADM, or a net jump of $796. In fact, the successive trough-to-peak distances have been lengthened throughout the entirety of the ADM range not only for this instructional unit schedule, but also for those schedules linked to the other principal school categories. With these distances widened, the economic incentives to be on a peak rather than a trough have, if anything, become greater. That is, the old system of high economic rewards for achieving a nearly arbitrary ADM count concurrent with high economic penalties for falling one ADM short of that count has been both retained and reinforced.[36] To the extent to which such a system actually affects local/district behavior, the state has encroached upon local control in a seemingly arbitrary and potentially dysfunctional way.

In summary, we have shown how HB 212 has aggravated (1) the wealth equalizing problem, (2) the cost index problem, and (3) the peak/trough incentives problem.

It is ironic to note that each of these problem-aggravating changes in the formula have very high, immediate price tags associated with their enactment (i.e., apart from the long-run monetary and non-monetary costs intrinsic to the problems themselves). To increase state guarantees from 95 to 97 percent of Basic Need will cost the state at least three million dollars. Increasing the cost indices (i.e., the Instructional Unit Allotment) for the different groups will also cost at least three million dollars. Finally, the increase in distances between peaks and troughs shown by the two plots discussed above (and caused primarily by the jump from $25,000 to $29,000 per instructional unit) will cost the state at least 21 million dollars.[37] In short, it seems that HB 212 is a very expensive "non-solution" to Alaska's school finance problems.

## Notes

1. This figure of seven percent was calculated by taking total 1975-76 BIA current operating expenses of $17,488,834 and dividing that sum by the grand total of 1975-76 current operating expenses, equal to $247,569,088, and multiplying the resulting fraction by 100.

2. The figure of 69 percent was obtained by taking the total of state revenues (e.g., $137,735,439 for City and Borough Districts plus $21,484,229 for Alaska Unorganized Borough District) and dividing that sum by the sum of total expenditures for those schools under the State's jurisdiction (e.g., $190,906,224 for the City and Borough Districts plus $39,174,030 for the Alaska Unorganized Borough District) and then multiplying the resulting fraction by 100.

3. As this report goes to press, the author has been made aware that much work is underway to make the computer share a greater portion of the processing burden attached with the state aid calculations.

4. According to a document entitled "Summary, Alaska Education Costs" compiled by the Center for Northern Educational Research (April, 1977), total operating expenses for fiscal 1974 were $166,649,827 versus $246,207,252 for fiscal 1975. The $79,557,425 increase over the two years represents a jump of 48 percent.

5. State of Alaska, Department of Education, Public School Foundation Program Computations, 1975-76 Fiscal Year, p. 2.

6. Ibid., p. 1.

7. Alaska School Finance Study, Center for Northern Educational Research, University of Alaska, Fairbanks, "Selected Financial Information, City and Borough School Districts, 1975-76 School Year," January, 1977, p. 1.

8. The new law, House Bill 212, will increase this guarantee of 95 percent to 97 percent. The postscript on HB 212 in Chapter VII discusses this, among other effects of the new law, in greater detail.

9. Public School Foundation Program Statute, Alaska Statutes, Title 14, Education, October, 1975, with 1976 Amendments (HB 601).

10. Upon talking to several Alaska school superintendents at the Annual Conference of the Alaska Association of School Administrators in Kodiak, October 21-23, 1976, and upon reading statements made by Alaska's chief state school officers, my personal impression is that those who are charged with using the formula have a less than complete understanding of its far-reaching intricacies.

11. Alaska Statutes, Sec. 14.17.250(18).

12. Ibid., Sec. 14.17.250(18).

13. The statistical jargon associated with each of these plots can be read at the bottom of the respective plots. The "PLOTTED VALUES - 44" on both plots informs us that data are plotted for 44 districts (this includes the 31 City and Borough Districts plus 13 of the REAAs). The "CORRELATION (R)" value indicates the zero-order Pearson correlation coefficient, an index of the degree to which a straight line can be fitted to the plotted points. Had all the points fallen "perfectly" such that a single positively sloping straight line would connect them all, the correlation coefficient would have taken on its maximum value of 1.0. Had they fallen in a circular cloud to which no line could be fitted, the correlation coefficient would have taken on a value of zero. (Had the points fallen such that a negatively sloping line could precisely connect them all, the correlation coefficient would have taken on its minimum value of minus 1.0). As can be seen in statistical terms, the fits of both Instructional Units per ADM versus State Entitlement per ADM (correlation coefficient equal to .876) as well as Instructional Units per ADM versus Total Expenditures per ADM (correlation coefficient equal to .727) were positive and remarkably tight. Multiplying each correlation coefficient times itself (as is done for us where we see "R SQUARED") and then multiplying by 100 yields the percentage variation in the first correlate which is statistically (not necessarily causally!) associated with variation in the second. That is, we can say that (0.876) x (0.876) x (100) = 76.8 percent of the variation in state entitlement per ADM is associated with variation in instructional units per ADM. Likewise, (0.727) x (0.727) x (100) = 52.9 percent of the variation in total expenditures per ADM is associated with variation in Instructional Units per ADM. Sophisticated statistics aside, the fact that the Instructional Units per ADM variable exerts greater influence on state entitlements can be seen perhaps most intuitively by examination of the plot on page 40 where Dollars per ADM--a direct translation of Instructional Units per ADM--range from a high of over $7,000/ADM to a low of $1,451 per ADM. The larger value is more than 480 percent of the smaller. On the other hand, the maximum percentage by which the maximum Instructional Unit Allotment exceeds the minimum Instructional Unit Allotment is only 43 percent. Thus the larger range of variability in the IU per ADM variable gives it a larger range of direct influence on the variability of final state aid and total expenditures.

14. ADM manipulation is a luxury open to only those districts whose number of instructional units are calculated on a school-by-school basis. Although this represents a large enough percentage of the total to warrant our keenest attention, the author only intends to point out that there do exist certain districts which cannot exercise this most valuable quirk in the law.

15. This informal communication took place at the Annual Conference, Alaska Association of School Administrators, Kodiak, Alaska, October 21-23, 1976.

16. Just how much more money the smoothing proposals would cost the state could be determined precisely with the aid of computer simulations. No change in the law should be enacted without such simulations.

17. James B. Hyman, "Cost of Education Indices: Alternative Methods, Issues and Answers," A Dissertation Synopsis, Stanford University School of Education, September, 1976.

18. As quoted in Alaskan Interregional Cost Differentials, Center for Northern Educational Research, University of Alaska, Fairbanks, March, 1977, pp. 51-52. Primary sources are cited as Alaska Airlines, Wien Air Alaska, Reeve Aleutian Airways, Polar Airlines, and Western Airlines.

19. Alaska School Finance Study, Center for Northern Educational Research, University of Alaska, Fairbanks, "A Strategy for Defining Basic Need (Revised)," November, 1976, p. 4.

20. Ibid., p. 12.

21. John McDermott, "Serrano: What Does it Mean?" Un Nuevo Dia, The Chicano Education Project, Lakewood, Colorado, Volume 3, Spring, 1977, pp. 5-18.

22. Alaska Statutes, Sec. 14.17.021, part C-2.

23. Conversely, one minus that quantity (i.e., $EP_i$) represents that fraction of Basic Need which the district is required by state law to provide if it desires any state aid whatsoever. In other words, that fraction $(1 - EP_i)$ multiplied times the district's Basic Need is equal to the district's Required Local Effort.

24. Alaska Statutes, Sec. 14.17.071.

25. As we see on page 9 , Required Local Effort also can be viewed as Basic Need times that portion of Basic Need which will not be funded by the state. In short, the expressions $RLE_i = BN_i \times \left[(1-ML) \times \left(\frac{PV_i}{PV_s}\right)\right]$ and $RLE_i = BN_i - SA_i$ are mathematically identical.

26. Alaska School Finance Study, Center for Northern Educational Research, "Ranking of City and Borough School Districts, 1975-76 by Discretionary Revenue Local Required Share Ratio," May 12, 1977.

27. Although the approach used in this example steps the reader through the formula at a much quicker pace than the approach used on pages 44 through 55 of School Finance in Alaska (Center for Northern Educational Research, 1976), identical numbers were used in order to provide the reader with (1) parallel references on the same basic formula, and (2) assurance that the two approaches are mathematically identical.

28. Rather than entering the often politically problematic area of pupil weighting, much the same weighting could be accomplished by having a separate economies-of-scale function for each of the ADM categories. The complexity added by this alternative could be compensated for by a more accurate micro-economic approximation of actual economies of scale within the particular ADM categories.

29. Unlike Linear (Multiple) Regression, which is a statistical technique designed to analyze the relationship between a continuous dependent variable and one (or more) continuous independent variables, Analysis of Variance is geared to help us look at the relationship between a continuous dependent variable and one or more categorical (i.e., discrete) independent variables (e.g., cost per ADM versus ADM category).

30. Harvey Brazer, "Adjusting for Differences Among School Districts in the Costs of Education Inputs: A Feasibility Report," Selected Papers in School Finance 1974 (Washington, D.C.: U.S. Department of Health, Education, and Welfare, Office of Education, 1975); Jay G. Chambers, Allan Odden, and Phillip E. Vincent, Cost-of-Education Indices Among School Districts, Education Finance Center, Education Commission of the States, December, 1976; Donald E. Frey, "The Determinants of Teachers' Salaries in New Jersey" (Washington, D.C.: The National Urban Coalition, May 28, 1976); W. Norton Grubb, "Identifying Teacher Supply Functions and Constructing Cost Indices: Methodological Explorations with California Unified School Districts," Preliminary draft to the U.S. Office of Education under contract OEC-300-75-0320; James B. Hyman, "Cost of Education Indices: Alternative Methods, Issues and Answers," A Dissertation Synopsis submitted at Stanford University, August, 1976; William Wasserman, Education Price and Quality Indexes (Syracuse: Syracuse University Press, 1963): "The National Education Association Index of 1930," "Price Indexes Compiled by Lorne H. Woollatt" and "Indexes Compiled by the New York State Department of Education."

31. The doctrine of "fiscal neutrality" was set forth by John E. Coons and two of his law students, Stephen Sugarman and William Clune, in their widely cited book, Private Wealth and Public Education, Cambridge, Mass.: Harvard University Press, 1970.

32. The actual legislated values of $LOM_{max}$, $LOM_{min}$ and SLOPE will be determined primarily on the basis of which tax rates will be selected by which districts. The mathematics of such a determination, such that the state will spend no more, nor no less, than it has budgeted, are not difficult. The key to success of such a program is to govern a five or ten year phase-in scheme rather than an abrupt jump to the respective desired local tax rates. The basics for such a scheme were developed by this author in his work for Dr. Michael Kirst and the State of California. Although that work was not published, the author would be happy to share it with the State of Alaska.

33. In the jargon of school finance, making awards on the basis of local property tax rates rather than on the basis of property valuations is known as "District Power Equalizing." For more on this, see Jones, "Review of Existing School Finance Programs," pp. 51-52. Cf. Johns and Solomon, "The Financial Equalization of Public School Support Programs in the United States for the School Year 1968-1969," pp. 90-91.

34. Many digits are carried to the right of the decimal point in order that the numerical results of this example, on a per ADM basis, will agree to the penny with the results of the earlier example, calculated relative to total ADM. Lopping off some of this precision (i.e., reducing the number of digits carried) would still get us into the same vicinity of total state aid relative to total ADM.

35. Certain economists (e.g., Milton Friedman) believe that market competition is the classic antidote to the allocation problems associated with a large monopoly. Friedman argues for a school finance system by which the forecasted expenditures per pupil would be mailed directly to the parents of school-age children in the form of an educational voucher, spendable only on the child's education. The parent would then be free to select that school which best suits the needs of his or her child. Friedman claims that not only would this give parents choice and economic power over key decisions affecting their child's education, but also that it would give schools incentives to diversify and, ultimately, provide more education value per dollar. That is, under a voucher system, those schools doing a poor job in the eyes of the public would, presumably, either have to improve their offerings or go broke due to lack of voucher money support.

36. The increase in the distances from peaks and troughs comes about not through HB 212's restructuring of the front end of the tables, but rather as the direct result of increasing the dollar value of the Instructional Unit. If the trend of such increases continues in future years, so too will the aggravation of the peak-trough incentives problem.

37. These costs represent rough desk calculator estimates based upon 1975-76 actual costs. Given this conservative data base, these estimates are likely to be smaller than estimates generated via a computer simulation based on the larger up-to-date actual costs.